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1906

Issued February 28, 1908

U. S. DEPARTMENT OF AGRICULTURE.

TWENTY-THIRD ANNUAL REPORT

OF THE

BUREAU OF ANIMAL INDUSTRY

FOR THE YEAR 1906.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1908.

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[STATUTES AT LARGE, VOL. 28 (CHAP. 23), P. 601.]

AN ACT Providing for the public printing and binding and the distribution of public documents.

SEC. 73. Extra copies of documents and reports shall be printed promptly when the same shall be ready for publication, and shall be bound in paper or cloth as directed by the Joint Committee on Printing, and shall be the number following in addition to the usual number:

Of the report of the Bureau of Animal Industry, 30,000 copies, of which 7,000 shall be for the Senate, 14,000 for the House, and 9,000 for distribution by the Agricultural Department.

Approved, January 12, 1895.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY,

Washington, D. C., June 3, 1907.

SIR: I have the honor to transmit herewith the Twenty-third Annual Report of the Bureau of Animal Industry for the year 1906, and recommend that it be published, as provided by section 73 of the act of Congress approved January 12, 1895.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

ORGANIZATION OF THE BUREAU OF ANIMAL INDUSTRY

Chief: A. D. MELVIN.

Assistant Chief: A. M. FARRINGTON.

Chief Clerk: E. B. JONES.

Biochemic Division: M. DORSET, chief; JAMES A. EMERY, assistant chief.

Dairy Division: ED. H. WEBSTER, chief; C. B. LANE, assistant chief.

Inspection Division: RICE P. STEDDOM, chief; MORRIS WOODEN, R. A. RAMSAY, and ALBERT E. BEHNKE, associate chiefs.

Pathological Division: JOHN R. MOHLER, chief; HENRY J. WASHBURN, assistant chief.

Quarantine Division: RICHARD W. HICKMAN, chief.

Division of Zoology: B. H. RANSOM, chief.

Experiment Station: E. C. SCHROEDER, superintendent; W. E. COTTON, assistant.

Animal Husbandman: GEORGE M. ROMMEL.

Editor: JAMES M. PICKENS.

Librarian: BEATRICE OBERLY ROGERS.

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TWENTY-THIRD ANNUAL REPORT OF THE BUREAU OF ANIMAL INDUSTRY.

REPORT OF THE CHIEF OF THE BUREAU FOR THE FISCAL YEAR ENDED JUNE 30, 1906.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., September 27, 1906.

SIR: I have the honor to transmit herewith a report of the operations of the Bureau of Animal Industry for the fiscal year ended June 30, 1906, together with plans and recommendations for the future.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

HON. JAMES WILSON, *Secretary.*

INTRODUCTION.

For the first two and a half months of the fiscal year covered by this report the work of the Bureau was under the direction of Dr. D. E. Salmon as chief, and for the remainder of the period it has been in charge of the writer. Doctor Salmon, after continuous service in the position of chief for more than twenty-one years, beginning with the organization of the Bureau in 1884, resigned that position early in September, 1905, and his resignation was accepted by you, to take effect November 1. The writer, who was assistant chief at the time of Doctor Salmon's resignation, was in charge of the Bureau work as acting chief from the middle of September (when Doctor Salmon relinquished the active management in order to complete some special work before his retirement), and was appointed chief on December 1.

The organization of the Bureau at the beginning of the fiscal year, as for some time before, consisted of ten divisions, or offices, as follows: The Inspection Division, in charge of the meat inspection, the inspection of animals for interstate shipment and for export, the inspection and supervision of vessels carrying export animals, and the eradication of contagious diseases; the Quarantine Division,

charged with the inspection and quarantine of imported animals and with keeping the accounts of the Bureau; the scientific laboratories, comprising the Pathological, Biochemic, and Zoological Divisions; and the Dairy Division, the Experiment Station, the Animal Husbandry Office, the Editorial Office, and the Library, each carrying on work of the character indicated by its title.

For the future some of the assignments of work have been slightly changed. The inspection of animals for export as well as of those imported and the inspection and supervision of vessels carrying export animals has been placed under the Quarantine Division, and that division has been relieved of the accounting work, which has been transferred to the newly organized Office of Accounts. The work of the Inspection Division has been subdivided, the meat inspection being placed in one section and the inspection of animals for interstate shipment and the eradication of contagious diseases in another. The work of the Dairy Division has been arranged in a more orderly manner by subdivision into several sections.

On January 6, 1906, the Bureau sustained the loss by death of its editor, Mr. George Fayette Thompson, who, in addition to his editorial duties, had charge of the Bureau's work relating to Angora and milch goats. Since his death the latter portion of his work has been transferred to the Animal Husbandry Office.

The total appropriations for the Bureau's work for the fiscal year amounted to \$1,603,000. On July 1, 1906, there were 1,455 employees on the rolls of the Bureau.

THE MEAT INSPECTION.

The meat inspection, as in previous years, has been the largest branch of the Bureau's work. In this service more than half the members of the Bureau force are engaged and more than half the appropriation for the year was expended.

As the conditions at the Chicago stock yards and packing houses have been so prominently before the public during recent months, it may be well to point out certain facts regarding the meat-inspection service as conducted by the Bureau.

Until the passage of the new meat-inspection law on the last day of the fiscal year (June 30, 1906), the inspection was carried on under the act of March 3, 1891, as amended by the act of March 2, 1895. That law provided for—

1. The inspection of all live cattle which were intended for export or whose carcasses or products were intended for export.

2. (a) The mandatory ante-mortem inspection of cattle, sheep, and hogs which were subjects of interstate commerce and which were about to be slaughtered at slaughterhouses, canning, salting, packing, or rendering establishments in any State or Territory, the carcasses

or products of which were to be transported and sold for human consumption in any other State or Territory or the District of Columbia.

(b) The additional permissive post-mortem examination of carcasses of all cattle, sheep, and hogs about to be prepared for human consumption at any slaughterhouse, canning, salting, packing, or rendering establishment in any State or Territory or the District of Columbia and which were the subjects of interstate commerce.

In other words, the ante-mortem inspection was made mandatory, while the post-mortem examination was only discretionary.

Some of the defects and limitations of this law should be noted to give an idea of the disadvantages under which the inspection has been conducted. In the first place, the law required the ante-mortem inspection of all cattle, sheep, and swine slaughtered at certain classes of establishments the carcasses or products of which were to enter interstate commerce, but no specific provision was made for funds with which to perform this work, and the annual appropriation has never been sufficient to enable the Bureau to cover all establishments carrying on an interstate business. Indeed, many establishments which applied for inspection had to be refused on account of lack of money to carry on the work.

While the law authorized the marking of meats and products which on inspection were found free from disease and wholesome, and prohibited the interstate shipment of meats and products found diseased and unwholesome, it made no provision and gave no authority for marking and rendering unfit for food purposes the diseased and unwholesome carcasses and products. As a matter of fact, however, it has long been the practise of the Bureau to require the destruction of all condemned carcasses and parts, though in case of the refusal of the proprietor to comply with such orders there was no remedy except to withdraw inspection.

It is very doubtful whether the law gave any authority for following up meats after they had once been inspected and passed immediately after slaughter, or for condemning any such meat which might afterwards become unwholesome or unclean before or during the process of canning or packing or before being placed on the market. But whether the law gave any such authority or not is a purely academic question, since the lack of funds made it impossible to extend the inspection to cover all the processes of curing, canning, packing, etc. No authority whatever to control the sanitation of the establishments or to prevent adulteration or the use of chemicals and preservatives was given by the law.

The inspection was therefore practically confined to the ante-mortem inspection of animals and the inspection of the carcasses immediately after slaughter. The meat found free from disease and

otherwise wholesome at the time of this post-mortem inspection was properly marked, and that found diseased or unwholesome was destroyed. There is no question that this inspection was efficient as far as it went and that it went as far as the law and the limited appropriations allowed. In fact, as hereinbefore and hereinafter shown, the Bureau in its efforts to maintain an efficient inspection sometimes even went so far as to assume authority not conferred by law. In all the recent agitation the wholesomeness of the inspected fresh meat has not been seriously called into question. The disclosures of unsatisfactory conditions have related almost wholly to the canned and prepared meats, the use of preservatives, and the insanitary condition and methods of the packing establishments—matters over which the Bureau has had no control whatever under the law.

About the time I became Chief of the Bureau a number of articles criticising the inspection methods and the insanitary conditions at the Chicago stock yards and packing houses began to appear in certain medical journals and other publications. The subject was considered in the Department, and it was determined that the best way to get at the matter was to send a competent committee to Chicago to make an investigation. This was finally decided on about the middle of February, but on account of illness the committee was unable to get away until early in March. This committee, consisting of Dr. John R. Mohler, chief of the Pathological Division of this Bureau; Dr. R. P. Steddom, chief of the Inspection Division of the Bureau, and Mr. George P. McCabe, Solicitor of the Department, made a thorough investigation and presented an exhaustive report under date of April 3. This report was promptly laid before you and by you transmitted to the President, and has been printed as a Congressional document.^a

Without waiting to send a committee to investigate and report, however, two orders regarding sanitation were issued in February. The Department Solicitor advised that, while such regulations were very necessary, the Department had no legal authority to enforce them; but it was decided to issue them nevertheless and to enforce them if possible. The first of these orders, issued February 8, 1906, to Bureau inspectors in charge of meat inspection, required that trucks and other receptacles used in handling tuberculous carcasses and parts thereof should not be used for any purposes other than handling condemned material and offal; also that all knives and other implements used, as well as the hands of the inspector, and the packing-house implements, should be washed in an antiseptic solution. Bichlorid of mercury tablets were furnished for this purpose.

^a The report referred to appears in the appendix of the present volume, page 406.

The other order regarding sanitation was as follows:

[Amendment No. 5 to B. A. I. Order No. 125.]

RULES AND REGULATIONS FOR THE INSPECTION OF LIVE STOCK AND THEIR PRODUCTS.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 14, 1906.

It is hereby ordered, That section 4 of B. A. I. Order No. 125 be, and the same is hereby, amended by the addition of the following:

Sanitation.—(e) Official establishments shall be kept in a clean and sanitary condition. Ceilings, side walls, pillars, partitions, etc., shall, whenever practicable, be frequently whitewashed; where this is impracticable they shall, when necessary, be washed, scraped, or otherwise effectually cleaned; likewise all trucks and other receptacles used in moving, mixing, storing, or curing meat or meat products shall be frequently cleaned, and beef carriers or other employees who handle meat in contact with their clothing shall be required to keep such clothing in a sanitary condition. Separate, suitably ventilated, and otherwise sanitary toilet rooms and rooms for the reception of clothing of employees shall be provided and so located that the odors therefrom do not penetrate the rooms or compartments in which meat or meat products are prepared, cured, stored, packed, or otherwise handled; all such rooms or compartments (except the killing floors) shall be provided with cuspidors, and employees who expectorate shall be required to use them.

JAMES WILSON, *Secretary.*

On receipt of the committee's report showing the conditions which existed at Chicago I immediately wrote to the inspector in charge at that station directing him to take steps for the improvement of these conditions, and sent a traveling inspector to Chicago to assist in this work. On April 9 an order was issued to all inspectors in charge of meat inspection, stating that the report of the committee had revealed some conditions which must be improved at once, and directing them to see that all requirements of the meat-inspection regulations were rigidly enforced and to report any establishment which failed to comply with any part of the regulations. On May 22 the inspectors in charge of the principal stations were instructed to report whether amendment 5, regarding sanitation, was being complied with, and to notify the proprietors of the establishments that lavatories must be installed, so that workmen could have no excuse for not keeping their hands clean, and that proprietors must see that employees did keep themselves clean. It was also ordered that meat must be raised from the floors, and that the practice of mixing meats upon the floors must be abandoned and suitable boxes or benches provided; also that wire netting and other covers for racks, vats, and boxes used for meats and meat products must be provided.

In order to correct an erroneous impression which has gained some currency, I wish to emphasize the fact that in all establishments where inspection is conducted by this Bureau all animals slaughtered are subjected to the same inspection, and all condemned carcasses and products are subjected to the same treatment, whether the meat is intended for local, interstate, or export trade, except in the case of the microscopic inspection of pork for trichinae, this particular inspection being applied only to pork intended for export to a few countries requiring such inspection. This microscopic inspection is in addition to the regular inspection which is applied to all carcasses.

The weak points and the limitations of the laws under which the meat inspection has heretofore been conducted have long been realized, and several times in the past recommendations have been made by the Secretary of Agriculture and the Chief of the Bureau for the enactment of new laws and the increase of appropriations in order to extend the inspection and improve its efficiency. On two or three occasions bills to remedy some of the defects in the law have been introduced in Congress, but they failed of passage.

The new law of June 30, 1906, commonly known as the meat-inspection amendment to the agricultural appropriation act, is appended to this report.^a This law greatly enlarges the powers of the Secretary of Agriculture and makes a permanent annual appropriation of \$3,000,000 to pay the cost of meat inspection. With the additional authority and money thus granted the service will be greatly extended and strengthened. It is expected to extend the inspection as rapidly as possible to all establishments which are engaged in interstate or foreign business and come within the law, and to apply the inspection not only to the live animals before slaughter and to the carcasses immediately after slaughter, but afterwards to the meats and meat food products in all the stages and processes of preparation, curing, canning, etc.; also to require sanitary equipment, conditions, and methods; to prevent the use of harmful chemicals and preservatives and of misleading labels, and to regulate the transportation of meat in interstate and foreign commerce. Regulations covering these various points have already been or soon will be issued.

WORK OF THE YEAR.

During the fiscal year 1906 inspection was inaugurated at 23 establishments. One of these had previously had inspection, but had been destroyed by fire; the remaining 22, located in 13 different cities, were establishments that had not theretofore had inspection. Inspection was not conducted during the fiscal year for various causes at 11 establishments which had had inspection in the previous fiscal year.

^a See appendix to this volume, page 339.

Of the 13 cities 6 were cities in which Federal inspection had not been previously conducted. Below are shown the number of establishments and the number of cities where inspection has been conducted during each fiscal year since 1891:

Number of establishments and cities where meat inspection has been conducted, 1891 to 1906.

Fiscal year.	Number of establishments.	Number of cities.	Fiscal year.	Number of establishments.	Number of cities.
1891.....	9	6	1899.....	139	42
1892.....	23	12	1900.....	149	46
1893.....	37	16	1901.....	167	52
1894.....	46	17	1902.....	156	50
1895.....	55	19	1903.....	156	50
1896.....	102	26	1904.....	152	51
1897.....	123	33	1905.....	151	52
1898.....	135	35	1906.....	163	58

The following statement shows the number of ante-mortem inspections of animals intended for slaughter, an increase of 4.69 per cent over the figures reported for the previous fiscal year:

Ante-mortem inspections for the fiscal year 1906.

Kind of animal.	For official abattoirs in cities where inspections were made.	For other cities and miscellaneous buyers.	Total inspections.	Rejected (subject to result of post-mortem inspection).	
				At abattoirs.	In stock yards.
Cattle.....	7,045,353	6,462,494	13,507,847	1,875	47,307
Sheep.....	8,221,977	7,072,004	15,293,981	921	6,763
Calves.....	1,036,836	651,851	1,688,746	460	13,979
Hogs.....	26,026,484	12,393,513	38,419,997	5,864	33,474
Total.....	42,330,709	26,579,862	68,910,571	9,120	151,523

The following table shows the number of regular post-mortem inspections made, and indicates an increase of 6.66 per cent over the previous fiscal year. The condemnations show an increase of 33.82 per cent over the previous year, due largely to the closer lines of inspection for tuberculosis.

Post-mortem inspections for the fiscal year 1906.

Kind of animal.	Number of inspections.			Carcasses condemned.			
	For official abattoirs.	On animals rejected in stock yards.	Total inspections.	For official abattoirs.	Of animals rejected in stock yards.	Total.	Parts of carcasses condemned.
Cattle.....	6,887,001	38,525	6,925,526	16,659	3,780	20,439	4,016
Sheep.....	8,219,605	4,025	8,223,630	4,990	817	5,807	123
Calves.....	1,100,220	2,555	1,102,775	3,432	1,419	4,851	89
Hogs.....	26,580,964	68,389	26,649,353	121,243	6,613	127,856	121,931
Total.....	42,787,790	113,494	42,901,284	146,324	12,629	158,953	126,159

In addition to the carcasses condemned on regular and microscopic examination, others were tanked as follows:

Carcasses of animals found dead or killed by local inspectors and tanked.

Manner of death.	Cattle.	Sheep.	Calves.	Hogs.	Total.
Died in yards.....	477	548	229	1,282	2,531
Killed in yards by local inspectors.....	417	164	6,694	10,537	17,812
Died at abattoirs.....	890	2,340	218	11,940	14,888
Total.....	1,784	3,047	7,141	28,759	35,231

The various diseases and conditions for which carcasses and parts were condemned and tanked during the year are shown in detail in the following table, which also includes animals found dead and those killed by local inspectors:

Diseases and conditions for which condemnations were made, fiscal year 1906.

Cause of condemnation.	Cattle.		Sheep.		Calves.		Hogs.	
	Car-casses.	Parts.	Car-casses.	Parts.	Car-casses.	Parts.	Car-casses.	Parts.
Actinomycosis.....	797	1,985			2	1	13	5
Tuberculosis.....	13,548	1,114	4		25		95,396	113,491
Caseous lymphadenitis.....			680	3			1	
Hog cholera and swine plague.....							19,329	
Texas fever.....	328				280			
Echinococcus.....			6				1	15
Meesles.....							13	
Scabies.....			2				26	
Eczema.....							3	
Erysipelas.....							22	
Cancer.....	22		4		1		11	
Tumors.....	9	3	7		1		624	275
Abcesses.....	94	242	108	22	24	2	1,256	419
Pneumonia.....	278		335		23		1,833	
Pleurisy.....	25		29	1	4		97	1
Carditis.....			4		1			
Enteritis.....	52		123		13		318	
Peritonitis.....	299		104		48		685	
Metritis.....	76		15		1		229	
Nephritis.....	2		11		9		49	
Uremia.....	8		26		3		2	2
Mammitis.....			2					
Septicemia.....	246		198		56		1,196	
Pyemia.....	456		201		51		3,038	
Gangrene.....	32		10		6	1	15	
Anemia, emaciation, marasmus.....	2,139		2,308		657		798	
Ascites.....	10		27		1		59	
Jaundice.....	9		488		18		920	
Asphyxia.....	19		46		2			
Arthritis.....			1		2			
Leukemia.....			2		2			
Pulmonary apoplexy.....			9					
Cysticercus tenuicollis.....			1					
Melanosis.....					2			
Extreme temperature, various causes.....			144		2		989	
Pregnancy.....	81		88				316	
Recent parturition.....	122		18				51	
Hernia.....	1		4				65	
Downers, bruised, injured, etc.....	1,786	672	833	97	391	85	1,019	7,723
Dead from various causes.....	867		2,873		444		13,222	
Too young.....			1		3,224			
Killed by local inspectors.....	417		164		6,694		10,537	
Total.....	21,723	4,016	8,821	123	11,992	89	151,615	121,981

The following table, showing the growth of the post-mortem inspection since it was first inaugurated, indicates that the number of inspections made the past year was the largest in the history of the Bureau:

Number of animals inspected at slaughter for abattoirs having inspection, 1891 to 1906.

Fiscal year.	Cattle.	Calves.	Sheep.	Hogs.	Horses.	Total.
1891	83,889					83,889
1892	3,167,009	59,089	588,861			3,809,459
1893	3,922,079	92,947	870,512			4,885,538
1894	3,861,594	96,331	1,020,764	7,648,146		12,626,836
1895	3,704,042	116,098	1,428,601	13,616,589		18,865,275
1896	3,985,484	256,905	4,629,796	14,250,191		23,122,876
1897	4,242,216	273,124	5,409,161	16,808,771		26,533,272
1898	4,418,788	244,330	5,496,904	20,898,199		31,058,171
1899	4,382,020	246,184	5,603,096	23,836,943	8,382	34,071,575
1900	4,841,166	315,698	6,119,886	23,836,884	5,559	34,619,188
1901	5,219,149	413,830	6,639,212	24,642,753	1,992	36,916,986
1902	5,559,969	565,836	7,434,878	25,277,107	1,649	38,829,439
1903	6,134,410	668,555	8,536,960	21,798,738	344	37,153,807
1904	6,350,011	764,590	8,261,051	24,128,462		39,504,114
1905	6,096,597	845,862	7,872,671	25,323,984		40,139,114
1906	6,925,526	1,102,776	8,223,630	26,649,353		42,901,284

The meat-inspection brand or label was placed upon 24,163,869 quarters of beef, 8,154,490 carcasses of sheep, 1,094,946 carcasses of calves, and 939,656 carcasses of hogs. Sacks and barrels of meat were sealed as follows: Beef, 123,470; pork, 1,120,955.

White meat-inspection stamps, indicating the regular post-mortem inspection, were affixed to packages of meat and meat products as follows:

Beef	7,684,116
Mutton	32,701
Veal	2,437
Pork	15,940,227
Total	23,659,481

The number of cars sealed containing inspected meats and meat products was 76,956.

The movement of inspected meats between official establishments is shown in the following table. A large amount of work was involved in supervising the shipment of this meat and in identifying it on arrival:

Movement of inspected meat between official establishments.

Class.	Number of quarters and carcasses.	Smaller pieces (weight).
Beef	Quarters. 1,904,068	Pounds. 179,345,864
Mutton	Carcasses. 24,103	4,982,206
Veal	86,884	816,449
Pork	31,556	459,311,407

CERTIFICATES OF INSPECTION OF MEATS FOR EXPORT.

There were 42,784 certificates of ordinary inspection issued to cover meats and meat products for export as follows: 1,304,923 quarters, 9,597 pieces, 787 carcasses, and 1,598,229 packages of beef, weighing 390,291,533 pounds; 42 carcasses and 20,482 packages of mutton, weighing 609,373 pounds; 3,788 carcasses and 646,103 packages of pork, weighing 201,453,171 pounds; a grand total of 592,354,077 pounds.

The following table shows, by years, beginning with 1898, the quantities of the different classes of meat for the exportation of which certificates of ordinary inspection were issued:

Quantities of meat for export under certificates of ordinary inspection, 1898 to 1906.

Fiscal year.	Beef.	Mutton.	Pork.
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
1898.....	339,650,091	324,996	244,956,482
1899.....	360,843,356	525,705	278,696,435
1900.....	439,138,233	680,897	272,050,663
1901.....	452,830,373	894,648	231,144,938
1902.....	410,990,762	1,145,246	188,360,011
1903.....	371,920,737	2,729,013	138,122,610
1904.....	419,058,781	712,089	154,442,440
1905.....	361,012,062	208,570	155,513,776
1906.....	390,291,533	609,373	201,453,171

The total cost of the work of ordinary meat inspection was \$789,263.76.

THE MICROSCOPIC INSPECTION OF PORK.

The number of hog carcasses examined for trichinæ was 536,997, classified as follows: Class A (free from all appearance of trichinæ), 523,945, being 97.57 per cent; class B (containing trichinalike bodies or disintegrating trichinæ), 6,220, being 1.16 per cent; class C (containing live trichinæ), 6,832, being 1.27 per cent.

The number of trichinous carcasses disposed of was 6,926, weighing 1,613,365 pounds, 47.24 per cent of which was tanked, the remainder being converted into cooked meat products.

The number of certificates issued for microscopically inspected pork was 3,104, covering 68,689 stamped packages containing 26,566,409 pounds of pork and pork products.

The following table shows, by years, the quantity of pork exported since 1892 to countries requiring microscopic inspection. The increase of 1906 over 1905 was 80.45 per cent.

Quantities of pork exported to countries requiring microscopic inspection, 1892 to 1906.

Fiscal year.	Pounds.	Fiscal year.	Pounds.	Fiscal year.	Pounds.	Fiscal year.	Pounds.
1892.....	22,025,698	1896.....	21,497,321	1900.....	55,809,626	1904.....	9,020,521
1893.....	8,069,758	1897.....	42,570,572	1901.....	35,942,404	1905.....	14,721,985
1894.....	18,845,119	1898.....	120,110,356	1902.....	38,681,229	1906.....	26,566,409
1895.....	39,355,230	1899.....	108,858,149	1903.....	19,108,341		

The cost of microscopic inspection was \$63,297.94, being an average of 11.79 cents for each carcass examined and 0.24 cent for each pound exported.

INSPECTION OF VESSELS AND EXPORT ANIMALS.

Seven hundred and forty-nine vessels carrying live stock were inspected before clearance. The number of certificates of inspection issued for American cattle exported to Europe was 1,312.

The following table shows the number of inspections of live animals for export and the number exported during the year:

Number of inspections of American and Canadian animals for export, number rejected, and number exported, fiscal year 1906.

Kind of animal.	American animals.			Canadian animals.		
	Number of inspections. ^a	Number rejected.	Number exported.	Number inspected.	Number rejected.	Number exported.
Cattle	805,045	1,516	^b 416,372	46,874	11	46,868
Sheep	137,824	98	^c 67,840	27,282	25	27,257
Horses	1,393	.....	1,252	6	.....	6

^a The apparent discrepancy between the figures of this column and those of the two following columns is due to the fact that a large proportion of the animals were inspected more than once, thus making the number of inspections considerably larger than the actual number of animals, and that in a few cases part of the animals inspected and passed for export were diverted and slaughtered in this country by the owners.

^b 34,181 via Canada.

^c 4,314 via Canada.

All animals included in the foregoing statement as exported were shipped to Great Britain except 7,981 cattle and 77 horses to Belgium, 110 horses to Germany, and 150 horses to France.

Other animals were exported as follows: 2,597 cattle, 1,360 sheep, 21 horses, 144 mules, and 1,061 swine, of which 1,193 cattle and 1,153 sheep were destined to Bermuda, 130 cattle to Barbados, 1,345 cattle to Brazil; 30 cattle, 56 swine, and 11 horses to Argentina; 9 cattle to Mexico, 1 bull to British Guiana, 77 sheep to the West Indies, 1 horse to Jamaica, 100 mules to Cuba; 11 cattle, 1,005 swine, 44 mules, and 9 horses to Hawaii, and 8 cattle to Lower California.

The following table shows the number of animals inspected on landing at the three British ports where the Bureau maintains inspection and to which the greater part of the exports go; also the number and percentage lost in transit. It will be observed that under the Bureau's supervision of this traffic the percentage of loss is very low.

Number of animals inspected at time of landing in London, Liverpool, and Glasgow, and the loss in transit, fiscal year 1906.

From—	Cattle.			Sheep.			Horses.		
	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.	Landed.	Lost.	Per cent of loss.
United States...	380,960	535	0.140	65,650	220	0.334	902	9	0.996
Canada.....	38,750	130	.334	25,203	890	1.524	6	.....	.....
Total.....	419,780	665	.158	90,853	610	.666	908	9	.991

Special certificates of health were issued for the exportation of 2,830 cattle, 309 hogs, and 5 goats.

Tuberculin tests were made on 447 cattle in order to meet the requirements of the countries to which they were intended to be exported. Of these cattle 410 passed and 37 were rejected.

The total cost of the Bureau work in connection with the exportation of live animals was \$49,349.22.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

In order to exclude from this country the contagion of the destructive animal diseases which exist in other parts of the world it is necessary to use the utmost vigilance with regard to imported animals. The perfection of the system of inspection and quarantine maintained on the Atlantic coast gives great protection to that section. Inspection is also maintained along the Canadian and Mexican borders, and arrangements are made for quarantine at certain points. As the Department refuses to permit the importation of animals from the Orient, owing to the great prevalence of dangerous animal diseases there, and as the importation of all kinds of animals from the Philippines is prohibited by Executive order for the same reason, no importations are permitted on the Pacific seaboard from across the seas. In spite of these precautions, however, there appears to be a possibility of contagion being brought in with forage or straw used as packing in China, or surreptitiously by pet animals. It is believed that the importation of forage from China and the use of hay or straw in packing goods for shipment from that country to the United States should be prohibited. There is especial danger that surra may be brought in by dogs from the Philippines, though the customs authorities have shown vigilance in preventing this.

All animals offered for importation are required to be inspected, and certain kinds, when coming from certain countries, are in addition required to be quarantined for a sufficient period to insure their freedom from contagion.

The following table shows the number of imported animals in-

spected and quarantined, and the number admitted on inspection without quarantine, during the fiscal year:

Imported animals inspected, with or without quarantine, fiscal year ended June 30, 1906.

QUARANTINED.

Port of entry.	Cattle.	Sheep.	Swine.	Horses.	Mules and asses.	Goats.	Other animals.
New York	500	523	55	.....	.....	270	a 66
Boston	85	52	.....	.....	.....	.....	.....
Baltimore	72	15	.....	.....	.....	1	.....
Canadian border ports:							
Beecher Falls, Vt.	70	14	1	.....	.....	.....	.....
Buffalo, N. Y.	9	1	2	.....	.....	.....	.....
Cape Vincent, N. Y.	2	.....	.....	.....	.....	.....	.....
Charlotte, N. Y.	2	.....	.....	.....	.....	.....	.....
Clayton, N. Y.	2	.....	.....	.....	.....	.....	.....
Detroit, Mich.	3	.....	1	.....	.....	.....	.....
Eastport and Calais, Me.	4	41	2	.....	.....	2	.....
Fort Fairfield, Me.	39	51	2	.....	.....	.....	.....
Hogansburg, N. Y.	2	.....	.....	.....	.....	.....	.....
Island Pond, Vt.	17	.....	8	.....	.....	.....	.....
Massena, N. Y.	10	2	.....	.....	.....	.....	.....
Newport, Vt.	4	2	.....	.....	.....	.....	.....
Ogdensburg, N. Y.	9	.....	.....	.....	.....	.....	.....
Sault Ste. Marie, Mich.	1	.....	.....	.....	.....	.....	.....
Vanceboro, Me.	8	8	.....	.....	.....	.....	.....
Total quarantined	789	704	66	.....	.....	273	66

* Comprises 4 antelopes, 1 anoa, 1 zebra, 1 stag, 1 waterbuck, 1 peccary, 2 wart hogs, 2 zebras, 13 camels, 1 gnu, 1 aoudad, 3 gazels, 1 alpaca, 1 thamin (deer), 2 mouffons, 1 muntjac, 5 llamas, 19 deer, 1 markhor, 1 nilgau, 1 thar (goat), and 3 giraffs.

NOT QUARANTINED.

Port of entry.	Cattle.	Sheep.	Swine.	Horses.	Mules and asses.	Goats.	Other animals.
New York .....	.....	.....	.....	2,650	33	.....	a 2
Boston .....	.....	.....	.....	92	8	.....	.....
Baltimore .....	.....	.....	.....	137	6	.....	.....
Philadelphia .....	.....	.....	.....	17	.....	.....	.....
San Francisco .....	.....	.....	.....	2	.....	.....	.....
From Mexico:							
El Paso, Tex. b	18,258	15,796	.....	104	153	2	.....
Eagle Pass, Tex. ....	.....	.....	.....	7	.....	.....	c 13
Laredo, Tex. ....	.....	.....	.....	106	1	.....	d 12
Nogales, Ariz.	7,141	1	2	17	109	40	e 4
San Diego, Cal.	671	4,160	18	277	128	.....	.....
Calxico, Cal. f	1,632	.....	.....	76	17	.....	.....
Canadian border ports:							
Alburg, Vt.	1	24	1	15	.....	.....	.....
Beecher Falls, Vt.	13	7	.....	35	.....	.....	.....
Bridgewater, Me.	1	.....	.....	2	.....	.....	.....
Buffalo, N. Y.	492	100,867	57	868	.....	1	g 5
Calais, Me. ....	.....	.....	.....	22	2	.....	.....
Cape Vincent, N. Y.	145	.....	.....	81	.....	.....	.....
Chateaugay, N. Y.	110	10	.....	38	.....	.....	.....
Clayton, N. Y. ....	.....	5	.....	1	.....	.....	.....
Derby Line, Vt.	4	29	.....	68	.....	.....	.....
Detroit, Mich.	696	743	72	736	4	.....	h 9
Eastport, Me. ....	.....	.....	.....	23	.....	.....	.....
Fort Covington, N. Y.	27	.....	.....	24	.....	.....	.....
Fort Fairfield, Me.	22	.....	1	129	.....	.....	.....
Hogansburg, N. Y.	1	.....	.....	17	.....	.....	.....

^a Zebras.

^b The figures for El Paso include 3,331 cattle, 92 horses, and 143 mules in transit to Mexico, and 772 cattle in transit to Canada.

^c Deer.

^d Four deer, 5 camels, 1 elk, and 2 llamas.

^e Two deer and 2 tigers.

^f The figures for Calxico include 2 cattle, 47 horses, and 8 mules, United States animals returned from Mexico.

^g Three elephants and 2 camels.

^h One deer, 1 elk, 2 llamas, and 5 camels.

Imported animals inspected, with or without quarantine, etc.—Continued.

NOT QUARANTINED—Continued.

Port of entry.	Cattle.	Sheep.	Swine.	Horses.	Mules and asses.	Goats.	Other animals.
Canadian border ports—Continued.							
Houlton, Me.	2			5			
Island Pond, Vt.	10	144	2	60			
Lowelltown, Me.	38	1		13			a 2
Malone, N. Y.	155	18		45			
Massena, N. Y.	2	1		5		2	
Monticello, Me.				1			
Moers, N. Y.	81			63			
Morristown, N. Y.	3	407		21			
Newport, Vt.	197	209	12	106		8	b 1
Niagara Falls, N. Y.	79	670	54	385			
North Troy, Vt.	73	13	2	16			
Ogdensburg, N. Y.	201	1	1	99			
Port Huron, Mich.	284	4,642	84	495	4		
Richford, Vt.	36	64	1	76			
Rochester, N. Y.				2			
Rouses Point, N. Y.	85	65		50		1	a 1
St. Albans, Vt.	14	3		83			
Sault Ste. Marie, Mich.	3			9			c 10
Swanton, Vt.	1	3	2	21			
Vanceboro, Me.	15	210		151			
Waddington, N. Y.	1			34			
Total not quarantined	30,494	128,092	309	7,234	460	54	59
Grand total	31,283	128,796	375	7,234	460	327	125

* Deer.

* Freak bull.

* Four deer and 6 caribou.

In addition to its regular quarantine stations at Athenia, N. J., Littleton, Mass., and Halethorp, Md., for the ports of New York, Boston, and Baltimore, respectively, the Bureau, in June, 1905, secured control of Simonsons Island, an isolated location on the Fresh Kills, a tributary of Staten Island Sound, as a place of special quarantine in cases where more complete isolation of the animals was desirable. This arrangement was first made for the quarantine of milch goats imported from Switzerland, under an agreement whereby the owner of the island was to accept a per capita fee, to be paid by the importers, as a rental or compensation, the importer likewise paying for the necessary feed, bedding, and animal attendants, under the rule governing the quarantine of animals. A similar agreement has been made for another year. This island was used for the quarantine of 139 head of goats in October, 1905, 35 head of goats in May, 1906, and 51 head of cattle in June, 1906.

The quarantine stations on the Atlantic seaboard, with the exception of that at Halethorp (near Baltimore), are in a satisfactory condition. At the latter station most of the buildings are in a dilapidated condition, and for the purposes of the port of Baltimore the station is not suitably located. The ground immediately adjoining is being surveyed for a race course, and this will further render the station unsuitable for quarantine purposes, as it would be impossible to keep away from the quarantine grounds the people who would

frequent the race track as employees and visitors. These circumstances will in all probability soon make it imperative to abandon the present station and find a new location. It is hoped that a location may be secured on the water front of the Patapsco River which will permit the unloading of animals directly from steamers or barges to a wharf on the quarantine ground. Some investigations have been made of land so located, and it seems probable that satisfactory arrangements can be made for the use of such land. In order to equip the new station with buildings and inclosures, however, an appropriation will be absolutely necessary, and I recommend that Congress be asked to appropriate an amount sufficient for this purpose.

TUBERCULIN TEST IN GREAT BRITAIN.

For the convenience of importers of fine breeding cattle the Bureau has continued making tuberculin tests in England and Scotland of cattle intended for importation into the United States. The results of these tests during the fiscal year are shown in the following table:

Results of tuberculin tests in England and Scotland of cattle for importation.

Breed.	Passed.	Rejected.
Ayrshire.....	17	10
Guernsey (in England).....	54	7
Dexter-Kerry.....	20	3
Shorthorn.....	10	2
Jersey.....	3	0
Aberdeen-Angus.....	31	2
Hereford.....	3	0
Dutch.....	30	9
Total.....	168	33

CONTROL OF CONTAGIOUS DISEASES.

The work of the Bureau for the control and eradication of contagious diseases has continued. This work during the past fiscal year, as heretofore, has consisted of the maintenance of a quarantine of the section infected with Texas or southern cattle fever and the supervision of the movement of cattle from that section to points above the quarantine line; also the eradication of sheep scab, cattle mange, scabies in horses, and a venereal disease of horses known as *maladie du coït*.

TEXAS FEVER.

During the quarantine season of 1905 there were received at live-stock centers 47,496 carloads of cattle shipped for immediate slaughter from points below the quarantine line, the whole number of such cattle being 1,279,453. There were also inspected in the noninfected

areas of Texas and Oklahoma 125,225 head of cattle which were permitted to be moved north for purposes other than immediate slaughter. Supervision was exercised over 100,916 dippings in crude petroleum, and over the cleaning and disinfection of 42,510 cars. The total cost of this work was \$45,984.81.

SHEEP SCAB.

In some States there has been a slight increase in sheep scab, but taken as a whole the condition is decidedly encouraging. The proportion of infected sheep during the past year was $5\frac{1}{2}$ per cent of those inspected, while during the previous year it was $7\frac{1}{2}$ per cent.

In Arizona the conditions are decidedly improved and the percentage of disease is less than in former years. Idaho, Utah, and Wyoming also show a decided improvement. During the fiscal year just closed the ratio of infected sheep in those States was 1 in 43, while for the previous year it was 1 in 14. It is expected that conditions in Utah and Wyoming will soon be such that the Department can remove the quarantine from those States. From a survey of the entire field there is cause for the belief that this disease is being gradually brought under control.

During the fiscal year the total number of inspections of sheep for scabies was 59,246,288, and the total number of dippings was 12,396,976, of which 1,661,020 were redippings.

The total cost of this work was \$181,414.39.

The following table shows the number of inspections and dippings of sheep for scabies, and cars cleaned and disinfected, 1900 to 1906:

	Fiscal year.						
	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Inspections.....	1,801,892	7,912,724	11,186,661	16,444,370	40,967,961	53,680,786	59,246,288
Dippings.....	628,838	1,084,868	1,017,162	2,167,002	9,578,476	16,873,659	12,396,976
Cars cleaned and disinfected.....			791	752	2,732	7,965	8,625

CATTLE MANGE.

During the fiscal year the Bureau, in cooperation with State and Territorial officials, has made rapid progress in the extermination of mange in cattle. The States of Washington and Oregon and large portions of the States of Kansas, Colorado, Wyoming, and Texas, and of the Territories of New Mexico and Oklahoma have been released from quarantine. The disease is being successfully controlled and eradicated in extensive areas in North Dakota, South Dakota, Wyoming, and Texas, and the early release of these areas from quarantine may be expected.

The total number of inspections of cattle for scabies during the fiscal year was 14,983,260, and the total number of dippings was 243,826, of which 24,688 were redippings.

The total cost of this work was \$83,108.46.

The following table shows the number of inspections and dippings of cattle for scabies, and cars cleaned and disinfected, by fiscal years, from 1904 to 1906:

	Fiscal year.		
	1904.	1905.	1906.
Inspections.....	1, 124, 321	14, 065, 267	14, 983, 260
Dippings.....	162, 554	563, 394	243, 826
Cars cleaned and disinfected.....	582	29, 897	19, 992

SCABIES IN HORSES.

The total number of inspections of horses for scabies was 27,507, and the total number of dippings was 690.

VENEREAL DISEASE OF HORSES.

The insidious venereal disease of horses known as *maladie du coït*, or dourine, which has existed in portions of South Dakota, Nebraska, and Iowa, is believed to have been practically eradicated as a result of several years' vigilant work by the Bureau. During the past fiscal year 965 inspections were made, and only 3 cases were found that were considered sufficiently suspicious for condemnation—1 stallion and 2 mares. Neither of the latter showed lesions characteristic of the disease on post-mortem examination. The stallion was killed by the owner and had been buried several days before the inspector reached the place, when it was too late to make a conclusive post-mortem examination. Animals that may possibly have been exposed to the disease will be kept under close observation, and any reports of suspected cases will be promptly investigated until sufficient time has elapsed to warrant confidence that the eradication is complete.

TEXAS FEVER INVESTIGATIONS AND TICK ERADICATION.

Special attention has been given during the year to the study of the disease commonly known as Texas fever, of the life history of the tick which transmits this fever, and of the methods for eradicating these fever ticks, in view of the proposed campaign for the eradication of the ticks from the infected section. For the purpose of giving information to the public on this subject two bulletins (Bureau Bulletin No. 78 and Farmers' Bulletin No. 258) have been prepared by Dr. John R. Mohler, chief of the Pathological Division, and issued during the year.

The Bureau has taken up with the various State and Territorial authorities the subject of eradicating the ticks, with a view to ascertaining whether or not the laws and regulations of the various States and Territories would permit of conducting a vigorous campaign against the fever tick. The State and Territorial laws should give to local officers authority to enter premises, to inspect live stock, and to enforce the necessary quarantine and disinfection. The laws should also give authority to the proper State officials to issue rules and regulations and to confer authority upon Federal representatives to act as officials of the State in such matters. Funds should also be provided for the employment of local inspectors. In a number of the States the laws respecting this subject are defective, and it is urged that such laws be enacted by the different States in the infected area as will enable close cooperation between this Bureau and the State in the work of eradicating cattle ticks.

Anticipating legislation by Congress making provision for cooperative work with State authorities for the eradication of the ticks, the Bureau made plans to place additional inspectors in the field and to cooperate with the local officials in the different infected localities in an endeavor to exterminate cattle ticks by the various methods. The act of Congress approved June 30, 1906, made an appropriation for this work, and it will be taken up actively at once under the supervision of Dr. R. P. Steddom, chief of the Inspection Division. It is expected that as a result of these efforts a number of counties and parts of counties in the vicinity of the present quarantine line will be freed from the ticks during the ensuing year so that the cattle can be released from restrictions. By directing the principal efforts from the quarantine line southward it is believed that the infested territory can be gradually reduced and the line pushed farther south from year to year. It should be understood, however, that the complete eradication of the ticks from the entire section is an undertaking of great magnitude and difficulty and one that will require several years for its accomplishment.

Experiments have been conducted at the Bureau Experiment Station near Washington, D. C., also in Virginia, and, with the cooperation of the South Carolina Experiment Station, at Clemson, S. C., regarding the life history of the Texas fever tick and the exact time required for the tick to live parasitically on the cattle as well as the length of time it can exist without a host. As a result of these investigations several methods for the eradication of ticks, which have been found to be satisfactory for the States in which they were tried and under the climatic conditions met during the experiments, have been recommended in the bulletins mentioned.

Besides the six methods already published there have been several combinations of these methods tried on certain farms with entirely

satisfactory results. Thus, on one Virginia farm where the conditions were not such as to warrant the use of any one of the outlined plans in its entirety, a combination was suggested which has succeeded in completely ridding the cattle and premises of ticks. The 16 dairy cattle were removed from the infected pasture on September 10 and then placed on a cultivated field where they were soiled. All ticks were carefully removed by hand three times weekly and burned. In this manner no tick was permitted to mature or to drop off during the egg-producing age. The cattle, which soon became tick free, were not placed on the original pasture until May 1, by which time it had also become free of ticks, and it has remained so.

A somewhat similar combination proved successful on another dairy farm in Virginia. The infected cattle were taken from one pasture early in June, 1905, and placed on a second pasture, from which they were moved September 11 to a cultivated field, where they were hand picked three times weekly. As no noninfected pasture was available and it was not desirable to go to the expense of fencing the field, these cattle were kept free of ticks by hand picking and by mopping with crude petroleum that portion of the skin usually infested with ticks, and were continued on this cultivated land until fall, when they were placed in a barn which had been previously well disinfected with a chloride of lime solution and the barnyard cleaned of all manure, litter, and other harborers of ticks and eggs. The following spring the two pastures, which in all probability were by that time free of ticks, were nevertheless burned off for the sake of safety, and the cattle were placed thereon in April and have since given no indication of becoming tick infested.

Experiments relative to the dropping off of ticks from cattle in feed lots were tried at the Bureau Experiment Station, also in Virginia and South Carolina, and the results were published in Bulletin No. 78.

The cooperative work being done in South Carolina consists of two demonstrations which have for their object the eradication of the Texas fever ticks from Oconee and Pickens counties. One demonstration has for its basis the known fact that the adult tick drops off the cattle to lay its eggs, after which it dies, and the young ticks can never reach maturity unless they gain access to the body of a host animal, in the absence of which animal they perish after varying lengths of time. The method being followed on one large farm heavily infested with ticks consists in pasture rotation, in the operation of which the original pasture is divided into two by a double line of fence about June 1, and the cattle are moved into one half, where they remain until September 10, after which they are moved three times at intervals of twenty days to fresh tick-free land from which the crops have been gathered. The cattle are then free from

ticks, and on November 10 they are moved to the half of the original pasture, which had been kept free of animals since June 1, by which time all the ticks it contained will have perished. By the following May all ticks on the other half will also have disappeared, both farm and cattle will be free of ticks, and the double line of fence can be removed. The second demonstration consists in the location of all the infected farms in the above-mentioned counties, and in hand mopping all the cattle on these infected farms in the fall with Beaumont crude petroleum to catch the last crop of ticks, and a similar treatment at the beginning of spring to kill all of those ticks which have survived the winter. This method has been followed with very satisfactory results, and the possibility of applying the same mode of treatment to cattle on large ranches by dipping with the view of destroying the last crop of ticks in the fall and the first crop in the spring is now receiving consideration.

In the practical operation of any method already outlined, or a combination of two or more of these methods, it is to be hoped that the Bureau will receive the cooperation as well as the support of all southern agriculturists, which is so essential if the ultimate object of tick eradication is to be obtained. And there is small use of one farmer or set of farmers freeing their lands and cattle of the parasites if their lands and cattle are to be constantly exposed to the danger of reinfestation from the ticks of their immediate nonprogressive neighbors.

A simultaneous experiment with the same generation of ticks has been inaugurated at the Bureau Experiment Station and at the South Carolina Experiment Station in order to determine if the first crop of ticks is less virulent than later crops or if the cattle in the cooler spring months are not so susceptible as in the hot summer months, but this experiment has not been concluded.

A considerable amount of work was done by the Bureau station in an attempt to discover a more satisfactory method than that in common use for the production of immunity in cattle against Texas fever. The method now in use is unfortunate in that it frequently causes quite severe disease and occasionally the death of the treated animals. The experiments have not progressed sufficiently to merit more than a simple reference to them.

Further investigations have been made relative to the persistence of the parasite of Texas fever in the blood of southern cattle after their removal from all sources of fresh infection or reinfection and the significance of this persistence. A report on these investigations, also a general article on the southern cattle tick, have been prepared for publication in the Twenty-second Annual Report of the Bureau.*

* See pages 49-78 of that volume.

TUBERCULOSIS.

EXPERIMENTS IN IMMUNIZING CATTLE.

A number of prominent investigators, both in this country and in Europe, have recently been testing and recommending various methods for the protective inoculation of cattle against tuberculosis. Their systems of operation are mainly based upon similar processes; that is, they all inject the cattle with tubercle bacilli of either human or bovine origin. There is, however, considerable variation in the manner of administering the injections and also in the number of applications considered necessary to produce adequate protection for the animal, and there is also a difference in the preferred age at which the cattle are to be treated. In order that the most promising of these methods for immunizing cattle against tuberculosis might be tested and that new features which are greatly to be desired and which are lacking in present methods might be perfected and proved, some comparative experiments have been conducted by the Pathological Division with the cooperation of the Experiment Station. A number of calves have been inoculated in a variety of ways and with differing amounts of living tubercle organisms from varied sources. Numerous check animals are also being used, and these, with the several lots of test cattle, will later be subjected to exposure to virulent tubercle bacilli. The lot of cattle showing the greatest proportion of resistant animals at the completion of this experiment will be selected as representing the most feasible and effective method of immunizing cattle against tuberculosis. It is very desirable that perfect protection be afforded the cattle, if possible, by a single inoculation of the protective virus. It is therefore one of the aims of the present work to select cultures possessing the greatest degree of virulence compatible with safety to the animals treated and at the same time to select some part of the animal's body as the seat of the injection that is but little liable to convey the micro-organisms to the glandular system, where they might readily cause the establishment of a generalized case of the very disease which it is so desirable to guard against. Owing to the slow development of tuberculosis naturally, no absolute selection of the best from among these various methods of protection can be made until the animals have proved by long exposure their ability to withstand the attacks of the tubercle bacilli.

TUBERCULOSIS IN HOGS.

Another phase of the subject of tuberculosis which has received a great deal of study by the Pathological Division is the increase in the number of tuberculous hogs received at abattoirs where Federal inspection is maintained. The records of the post-mortem inspectors at the various packing houses have been examined with a view to

ascertaining the geographical location of the most serious centers of the disease, and at the same time tabulated forms have been prepared which show at a glance the proportion of cases in which the disease is limited to the throat of the hog, those where the lesions are localized but are established elsewhere than in the throat, and finally the proportion of serious generalized cases. It has been found that approximately 92 per cent of the 96,000 hogs thus reported tuberculous were affected in the cervical glands, and that some 30 per cent of these had no other lesion. The necessity of careful inspection of each head at the time of slaughter needs no further demonstration.

An effort has been made by the Pathological Division in conjunction with the Experiment Station to discover the most probable source of infection of these animals. It has been found that wherever tuberculous hogs are marketed from a farm the cows of that farm are tuberculous, or else the hogs have been fed upon skim milk or separator refuse from some public creamery, to which the milk of tuberculous cows, or perhaps of but a single tuberculous cow, is delivered. Separator sediment has been obtained from several suspected creameries, and animal inoculations and microscopic examinations have demonstrated the presence of tubercle bacilli in 25 per cent of the samples of such refuse, thus proving the necessity of guarding calves and pigs from this source of infection. Such milk may be sterilized by warming to 176° F. (or 80° C.). One instance of serious infection was discovered, where the tuberculous cattle which originally brought the disease to the ranch had been destroyed. Still the disease persisted in attacking on an average some 24 per cent of the hogs marketed from the place during the following three years. Investigation then showed that the brood sows, which had been retained for some time, were badly infected and that they served as sources of tubercular contamination to each succeeding generation of pigs.

The investigations during the past year have therefore included the infection of sucking pigs through the tuberculous mammae of their mothers. Other hogs have been exposed to infection by following tuberculous cattle, where they had full access to all excretions from them, others have been fed with tuberculous milk, and still others have been penned with cattle that were being fed upon tubercle bacilli of artificial cultivation in order that the infectiveness of the bacilli after passage through the alimentary tracts of the cattle might be observed. It was shown that hogs readily contract tuberculosis from eating the feces of tuberculous cattle and that this is probably one of the commonest causes of tuberculosis among hogs. Hogs were found invariably to show tuberculous disease of the lymph glands located at the angles of the jaws when infection reached their bodies through ingestion. Tubercle bacilli given cattle

in their drinking water were found to pass through the entire length of their digestive apparatus and to appear in their feces without having lost the power to produce tuberculous disease. This last fact indicates that animals with tuberculous lungs, while they do not expectorate after coughing up tuberculous material, nevertheless scatter bacilli freely, by swallowing them, having them pass through their intestines, and discharging them with their feces.

Experiments in the application of the tuberculin test to hogs were also made in connection with the above studies, and it was shown that if the proper precautions are taken, the diagnostic value of tuberculin with hogs is as great as with cattle. A method of procedure which was reliable in 97 per cent of the animals tested has been found. Bulletin No. 88, which contains full information upon these subjects, has just been issued.

OTHER EXPERIMENTS WITH TUBERCULOSIS.

It was shown by the investigations of the Experiment Station that the locations of lesions in the bodies of animals affected with tuberculosis is no guide as to the mode of infection, and that pulmonary disease is the most frequent form in which tuberculosis occurs is not necessarily because the commonest mode of infection is through the respiration, but more probably because of the relation of the lymphatic stream to the venous circulation and the filtration by the lung of the venous blood after the lymph has been poured into it and before it reaches any other organ.

Guinea pigs, which are generally regarded as extremely susceptible to tuberculosis, irrespective of the manner in which they are brought in contact with the infection, were found to possess a high degree of immunity when the infectious material entered their bodies through ingestion in the form of artificially infected milk. The contrary was shown to be true of hogs, which were found to be very susceptible to ingested infection of the kind that failed to injure the guinea pigs. It should be added that the immunity of guinea pigs to ingested tuberculosis infection has a parallel in a similar immunity possessed by them to respired infection. Among many hundreds confined for varying periods of time during the last ten years in a small one-room animal hospital, which contained tuberculous guinea pigs at all times and for long periods of time, also tuberculous monkeys and rabbits, only one guinea pig is known to have contracted tuberculosis. This one animal became affected with what may be called, to distinguish it from artificially induced disease, naturally acquired tuberculosis through the intensest kind of exposure. It was one of three young produced in a small cage containing six adult females affected with generalized tuberculosis. The tuberculous mother nursed this and the other two young, which remained healthy.

To injected tuberculous infection, quite independent of the character of the injection, guinea pigs have always been found to possess the high susceptibility with which they are commonly credited. This subject has been gone into at some length because it is of considerable importance in view of the extent to which guinea pigs are used by investigators in their studies of tuberculosis.

The examination of the feces of a number of tuberculous cattle showed that they are frequently very rich in acid-fast bacteria; that is, bacteria which have the microscopic appearance of and conduct themselves precisely like tubercle bacilli in the presence of various reagents. Such acid-fast bacteria could not be detected in the feces of the station cattle that are free from tuberculosis. In two cases, with the feces of two tuberculous cows, the acid-fast bacteria were definitely proved by inoculation tests to be tubercle bacilli. That the feces of tuberculous cattle may contain innumerable virulent tubercle bacilli must be regarded as a seriously important fact.

Cultures of tubercle bacilli which have been used since 1902 for the study of the transformation of characteristics of tubercle bacilli following their long-continued cultivation under artificial conditions have been kept under observation in the Pathological Division during the year, and the changes which have occurred in them have been noted.

Tubercle bacilli have been recovered from several rare animals at the National Zoological Park, such as the rattlesnake, the camel, the beaver, kangaroo rats, and the roughed or crab-eating fox, and it is of interest to note that these animals suffer from natural infections with tuberculosis, and that in most instances the micro-organisms present conform to the human type of tubercle bacilli.

DISTRIBUTION OF TUBERCULIN.

The demand for tuberculin, which is prepared in the Biochemic Division and furnished free of charge by the Bureau to authorized health officers in the various States and cities, greatly increased during the past year. The total amount of tuberculin prepared and shipped during the year was 103,510 doses, an increase of approximately 40 per cent over the amount sent out during the previous fiscal year.

HOG-CHOLERA INVESTIGATIONS.

In the previous annual report the results of the experiments concerning the etiology of hog cholera were briefly described. The Biochemic Division, in pursuing this work further during the past fiscal year, has demonstrated that the filterable virus which has already been shown to be the primary cause of hog cholera in southwestern Iowa is also present in outbreaks of that disease occurring in eastern

Nebraska, in central Iowa, and in Virginia. The outbreaks which have been studied in these localities possessed all of the well-known characteristics of hog cholera. These experiments demonstrated that the filterable virus is not peculiar to hog cholera as it is found in southwestern Iowa, and they also indicated that this virus was widely distributed and probably the active causative agent of all outbreaks of that disease. A number of experiments having for their object the determination of the mode of transmission of the disease, the portal of entry of the virus into the hog's body, the length of life of the virus outside of the hog's body, and the nature of the virus itself have been carried out, and the results will all be published later in bulletin form.

In connection with the other experiments the bactericidal action of hog's blood has been investigated and the results are now ready for publication. It is very gratifying to note that these recent experiments have substantiated in every way the results published in Bulletin No. 72.

In addition to the work just described, a certain number of experiments concerning the production of immunity from hog cholera have been arrived at, these immunity experiments being based upon the recently demonstrated fact (see Bulletin No. 72, Bureau of Animal Industry) that the primary cause of hog cholera exists in the blood of hogs sick of that disease, but not in pure cultures of *Bacillus cholerae suis*, which had previously been regarded as the cause of hog cholera. In a general way, the methods employed may be said to embrace the following general principles:

(1) The injection of hogs immune from hog cholera with blood from hogs sick of that disease.

(2) The drawing of blood from the immune hog hyperimmunized by injections of diseased blood, and the use of this immune blood, either alone or in conjunction with diseased blood, for immunizing healthy hogs or treating those sick of hog cholera.

By methods based on these principles we have secured from each of three different immunes, treated with different strains of diseased blood, sera which in doses of 10 c. c. to 20 c. c. afforded complete protection to nonimmune hogs against an infection which was fatal to from 70 to 100 per cent of untreated animals.

In view of these favorable results the process was patented in such a manner as to insure to all the people in the United States the right to its use free of any royalty, the patent being taken out in this way by Dr. M. Dorset, chief of the Biochemic Division, who planned and directed the investigations. The number of experiments thus far carried out is not considered sufficient to warrant the present recommendation of this process for general use, but further experiments

are being pushed as rapidly as is consistent with thoroughness, and it is hoped that a detailed statement of the results obtained may be made during the present year.

Experiments in the prevention of hog cholera by selective breeding are being continued with the object of developing by artificial selection a race of hogs which will possess partial or complete immunity from hog cholera. This work, which is carried on by the Biochemic Division in cooperation with the Experiment Station, was begun several years ago, naturally immune hogs being used as a basis and each litter exposed to infection. Thus there were retained out of each litter only those animals which showed the greatest powers of resistance. Several generations of animals have been exposed to disease during the last two or three years and the work is still being carried on, but sufficient results have not been obtained to warrant an expression of opinion as to the final outcome.

GLANDERS.

During the year isolated outbreaks of glanders have been reported from various quarters, and material from suspected cases has been forwarded to the pathological laboratory for examination and diagnosis. Nasal secretions and tissues from horses were received from North Dakota, Connecticut, Maryland, Virginia, and the District of Columbia. The samples from Connecticut proved negative for glanders, but positive results were obtained from all other sources. Cases occurring in the District of Columbia come directly under the supervision of the Chief of the Bureau of Animal Industry, who directs the disposition of the animals, the isolation and testing of exposed animals, and the disinfection of the premises.

Of very great importance for the diagnosis of glanders is the Gruber-Widal reaction, first recommended by MacFadyean in 1896, which has been made use of during the past few years. It has been employed in a number of cases quite successfully, but up to the present time has not been used as a routine measure, as the character of most of the specimens received makes it necessary to rely for diagnosis either upon the Strauss inoculation method or the isolation of the specific bacillus itself. The Strauss method, in our hands, has also given excellent results, and but for the time required would be an ideal means of diagnosis.

The serum diagnosis (or the Gruber-Widal test) of glanders consists in the addition of fixed, definite quantities of blood serum from the suspected animals to young cultures of the *Bacillus mallei*, and, if the case be positive, results in an agglutination or aggregation of the isolated bacilli into small clumps, which eventually cling to the side or drop to the bottom of the tube of culture medium in which they have previously been held in suspension.

DISTRIBUTION OF MALLEIN.

The Bureau has continued to furnish mallein free of charge to authorized health officers and to the War Department, and during the fiscal year 10,105 doses, prepared by the Biochemic Division, were so distributed. This represents an increase of about 40 per cent over the distribution of the preceding fiscal year.

BLACKLEG.

The great demand for blackleg vaccine still continues, thus showing the confidence of the stock raiser in the efficacy of vaccinating his young cattle for the prevention of spontaneous outbreaks of this virulent disease. During the year there have been prepared in the Pathological Division and distributed among stock owners 1,350,915 doses of vaccine.

The results of inoculations for the year ending June 30, 1905, as reported to the Bureau by the stock raisers who have used the vaccine, are as follows:

Results obtained from vaccine distributed during the fiscal year ended June 30, 1905.

State or Territory.	Number of reports.	Number of cattle vaccinated.	Deaths same season previous to vaccination.		Died after vaccination.					
			Number.	Per cent.	Within 48 hours.	From 2 to 7 days after.	within 1 year.	Number of cases due to mistakes.	Total number.	Percentage of deaths.
Arizona.....	50	5,320	318	5.97	5	4	18	.....	27	0.57
Arkansas.....	20	826	67	8.11	.....	5	1	.....	6	.72
California.....	408	47,064	819	1.74	15	30	144	4	193	.41
Colorado.....	609	65,663	896	1.36	17	58	219	5	299	.45
Idaho.....	88	2,788	114	4.09	1	1	.....	.....	2	.07
Illinois.....	72	3,076	129	4.18	.....	4	21	.....	25	.81
Indiana.....	11	501	14	2.79	.....	.....	.....	.....	.....	.....
Indian Territory...	36	3,686	173	4.69	.....	2	47	.....	49	.10
Iowa.....	111	7,402	144	1.94	5	6	100	3	114	.15
Kansas.....	522	68,749	878	1.27	20	60	174	8	256	.037
Kentucky.....	16	634	27	4.25	1	2	2	.....	5	.078
Michigan.....	3	52	.....	.....	.....	.....	.....	.....	.....	.....
Minnesota.....	15	640	24	3.75	2	2	1	.....	5	.078
Mississippi.....	5	263	5	1.9	.....	.....	4	.....	4	1.5
Missouri.....	658	26,564	463	1.7	15	20	81	8	124	.46
Montana.....	274	32,313	455	1.4	6	22	94	.....	128	.39
Nebraska.....	1,534	132,150	1,858	1.4	60	107	458	21	626	.47
Nevada.....	5	604	8	1.32	.....	.....	3	.....	3	.49
New Hampshire.....	2	43	.....	.....	.....	.....	.....	.....	.....	.....
New Mexico.....	30	8,758	181	2.06	.....	.....	97	.....	97	.11
New York.....	13	252	16	6.34	.....	.....	5	.....	5	.19
North Carolina.....	37	1,482	50	3.37	.....	1	3	.....	4	.27
North Dakota.....	345	29,444	515	1.74	30	10	104	11	155	.52
Ohio.....	51	18	6	3.33	.....	.....	.....	.....	.....	.....
Oklahoma.....	56	8,267	112	1.35	5	30	10	1	46	.56
Oregon.....	71	9,513	121	1.26	1	4	21	.....	26	.27
Pennsylvania.....	1	600	.....	.....	.....	.....	.....	.....	.....	.....
Porto Rico.....	3	600	10	1.66	.....	.....	6	.....	6	1.00
South Dakota.....	433	48,226	708	1.45	10	30	134	16	240	.49
Tennessee.....	43	1,705	66	3.87	1	3	16	.....	20	1.11
Texas.....	959	149,248	2,278	1.52	57	210	886	14	1,167	.77
Utah.....	24	3,162	29	.91	1	3	.....	.....	4	.012
Vermont.....	2	19	.....	.....	.....	.....	.....	.....	.....	.....
Virginia.....	359	8,497	272	3.21	.....	9	27	4	40	.47
Washington.....	44	2,360	68	2.88	.....	5	7	.....	12	.51
West Virginia.....	115	3,622	83	2.2	3	1	25	.....	29	.8
Wisconsin.....	9	533	18	3.7	.....	.....	8	.....	8	1.4
Wyoming.....	306	58,782	471	1.8	14	30	170	24	238	.4
Total.....	7,235	733,421	11,381	1.55	269	709	2,866	119	3,965	.54

After eliminating the number of cattle which die within forty-eight hours after vaccination as a result of being already infected with blackleg at the time of injection, and those whose death has been due to mistakes in performing the operation, the number of cases that died after vaccination is reduced to 3,575, or 0.48 per cent, whereas the losses without the use of vaccine were formerly as high as 10 or 12 per cent of the calves produced annually in the infected districts.

RABIES.

Within the District of Columbia there has been a considerable reduction in the frequency of cases of rabies during the past year. Of the 30 suspected cases examined in the laboratory of the Pathological Division from all sources, 16 proved positive, of which number only 8 came from within the District, as compared with 13 for a similar period of time last year, or a reduction of 38 per cent. In the following table the source and species of the animals affected and the result of the experimental animal inoculations and microscopic examination of the plexiform ganglia, together with the number of persons or animals bitten, are given:

Results of inoculation tests and microscopic examination for rabies.

Date.	Record No.	Kind of animal	Received from—	Result of inoculation.	Diagnosis by histological examination.	Persons or animals bitten.
1905.						
July 3	388	Steer	District of Columbia..	Positive	None made...	
Sept. 5	394	Dog	Flat Rock, N. C .....	.....do .....	.....do	1 woman, 2 dogs.
Sept. 29	395	.....do	District of Columbia..	.....do .....	.....do	
Oct. 4	396	.....do	Drivers, Va. ....	.....do	Positive	1 child.
Oct. 23	397	.....do	District of Columbia..	.....do .....	.....do	1 man.
Nov. 9	398	.....do	Fairlands, Md. ....	.....do .....	.....do	1 man; scratch.
Nov. 11	399	.....do	District of Columbia..	.....do .....	.....do	1 child.
Nov. 18	400	.....do .....	.....do .....	.....do .....	.....do	1 girl.
1906.						
Jan. 12	414	Dog	Landover, Md.	Positive	Positive	2 men.
Jan. 13	417	.....do	Rockville, Md. ....	.....do .....	.....do	
Jan. 16	422	.....do	Arlington, N. J. ....	.....do .....	.....do	Several men and dogs.
Mar. 8	504	.....do	Norfolk, Va. ....	.....do	Not character- istic.	1 girl.
Apr. 21	558	.....do	District of Columbia..	.....do	None made...	
May 28	596	.....do .....	.....do .....	.....do	Positive	4 persons.
May 29	598	.....do .....	.....do .....	.....do	None made...	
June 16	614	.....do	Blacksburg, Va. ....	.....do .....	.....do	Several dogs.

In the 10 positive cases in which the plexiform ganglia were sectioned there was only one case (No. 504) in which the lesions were not sufficiently marked to base a positive diagnosis without waiting two weeks for the rabbits to develop the symptoms, and in this case the dog was killed during the course of the disease. This demonstrates the necessity of allowing the animal to die naturally from the effects of rabies if an early diagnosis by means of a ganglia examination is to be assured.

Rabies has been quite prevalent, however, in the portion of Maryland adjacent to the Bureau Experiment Station, and several dogs have been tested at the station. It is believed that this locality is not more especially infected than many other places, but that the frequency with which rabies is found there within a small circumscribed area is probably due more to the careful attention given to the subject than to the more common occurrence of the affection.

The great variations in the histories, symptoms, and autopsy lesions of rabid dogs make a diagnosis practically impossible without inoculation or microscopic tests. Our experience is such that we regard it as real wisdom to place under proper restraint at once every dog that shows abnormal symptoms of any kind. The restraint need not and should under no circumstances be of a cruel kind. It is much easier to terminate a temporary restraint after the dog has recovered than to correct the damage he could do if his affection proved to be rabies.

During the year three experiments were made by the Pathological Division in order to test the effect of filtration on the virus of rabies. The material used was taken from rabbits dead as a result of inoculation with street virus. The brain was removed, macerated in a mortar, and made into an emulsion with physiological salt solution. This emulsion was then mixed with a bouillon culture of *Bacillus proteus vulgaris* of Häuser and filtered through a Pasteur-Chamberland B filter, the filtration being hastened by a vacuum of 25 inches. Cultures made from the filtrate remained sterile, and rabbits inoculated intracerebrally with the material remained healthy, while the check animals inoculated in a similar manner with the nonfiltered emulsion died in every case with typical symptoms of rabies. We therefore conclude that the virus is nonfilterable.

Having established this fact, it was then decided to make routine examinations for the presence in the Purkinje cells of the cerebellum and in the cells of the hippocampus major of the so-called Negri bodies which have recently been considered as the etiological agents of the disease. These bodies are cell inclusions found by Negri in 1903, and claimed by him to be protozoa and the specific cause of rabies. They vary in size from 0.5 to 25 microns in diameter, and while the filterability of these bodies may not be impossible, nevertheless the failure of the virus of rabies to pass through the fine meshes of a Chamberland B filter in the above-mentioned experiments seems to be additional proof of the etiological significance of these cell inclusions. They have been found varying in size, shape, and number in all the positive cases for which they were examined, but in none of those cases which were proved negative by other tests. As these examinations did not include all the cases that were received during the fiscal year the results have not been

included in the above table; but it is apparent that the finding of Negri bodies in the brains of animals suspected of rabies is the most satisfactory and most rapid means available for the diagnosis of this disease.

MISCELLANEOUS INVESTIGATIONS OF DISEASES.

SO-CALLED BOTTOM DISEASE OF HORSES.

"Bottom disease," an affection of horses pasturing in the bottom lands along the Missouri River in Iowa and Nebraska, is under investigation by the Pathological Division. At the present stage of the work there appears reason for associating this malady with an affection of cattle known in Nova Scotia as Pictou disease, with Winton disease of horses of New Zealand, and with Molteno cattle disease of South Africa. The tissues examined present practically the same lesions as those described for the above-mentioned affections—namely, interlobular connective tissue hyperplasia, fatty infiltration of the liver cells, and hemorrhages into the spleen.

Pictou disease, Winton disease, and Molteno cattle disease have been investigated time and again in an endeavor to find a causative agent. All inoculation experiments have failed, and it has only been found of late that feeding experiments with certain weeds have given seemingly reliable results.

Pictou disease, occurring in Pictou and Antigonish counties, Nova Scotia, is now ascribed to the ingestion of a weed called ragwort. Winton disease is thought to be caused by a member of the ragwort family, *Senecio jacobæa*. The Molteno disease of South Africa is probably induced, according to recent investigations, by still another ragwort, *Senecio burchelli*. At least these weeds when fed to the animals in their respective localities have produced diseases followed by a train of symptoms corresponding to those seen in the naturally induced disease. The post-mortem findings were also quite similar. It was also proved that these plants were most dangerous in the young state. Yet another variety known as *Senecio latifolius* was found to be deadly to stock.

Feeding experiments have been planned by the Bureau, and a study of the varieties of weeds found in the infected area of Nebraska and Iowa is now in progress.

A MOUTH DISEASE OF GOATS.

Within a week after the importation of 34 Saanen and Toggenburg goats from Switzerland and while they were still held in quarantine at Simonsons Island, New York, a peculiar mouth disease simulating the virulent foot-and-mouth disease of Europe was observed by the superintendent of the quarantine station, who imme-

diately telegraphed for the pathologist of the Bureau to make an investigation. On arrival it was found that at least 32 per cent of the flock was showing more or less advanced symptoms of the disease. After a careful clinical examination of all the affected animals, which included the taking of temperatures and the examination of the mucous membranes of the mouth, eyes, and nostrils, a diagnosis of impetigo labialis was made. This disease is also known as facial dermatitis, orf, and cursta labialis in England and Scotland, and teigmaul and maulgrind in Germany. Reports have been received of its prevalence in Canada, West Indies, and several sections of the United States.

The lesions in the early stages usually appear as an acute localized inflammation of the skin on the outside of the lips. This pimple-like formation is attended with much inflammatory swelling with a decided tendency to the formation of pustules. They dry and form crusts of a dark grayish color and of a fungoid appearance. The growths extend rapidly and become confluent in the course of a few days, forming a large diffuse scab, which is found when removed to cover a suppurative surface. Simultaneously with this the lips become tumefied, swelling to three or four times their normal thickness. The appetite usually remains good, but the animals feed with great difficulty owing to the sensitiveness of the affected parts. In the most advanced cases the scab extends from the lips up over the cheeks and eyes, and in some instances a muco-purulent nasal discharge appears, which adheres to the nostrils and, together with the swollen condition of the surrounding tissues, causes a more or less complete occlusion of the air passages, resulting in labored breathing upon exercise. In some cases the lesions extend into the mouth, producing erosions on the inside of the lips, on the gums, and on the maxillary pad of the hard palate. These lesions, which are of a spongy consistency and present a papillomatous appearance, were especially noted on the smaller goats. Similar wartlike growths have been noticed on the teats and udders and on the legs, especially about the coronet and in the fold of the fetlock. The disease has been transferred to sheep and goats, but cattle appear to be insusceptible. Work is at present being performed with the view of determining the nature of the causative agent of the affection.

The lesions readily yield to a treatment of boracic acid, sulphur, and petrolatum, and one or two applications are usually sufficient to cure every case without complications. In fact, the disease appears to respond quickly to any of the common antiseptic solutions.

BOUNDWORMS IN SHEEP.

Throughout the more thickly settled regions of the United States one of the most important factors, if not the most important one, in

the lack of success commonly experienced in sheep raising is the damage caused by internal parasites, and thousands of farmers in the eastern half of the United States have been driven to abandon the sheep industry because of losses among their flocks due to parasitic infection. The roundworms occurring in the alimentary canal are as a group probably the most important of the parasites of sheep, comprising no less than fifteen to twenty distinct species, some of which are both very common and decidedly injurious.

Because of their importance an investigation of these parasites has been undertaken by the Zoological Division with the intention of describing the various roundworms parasitic in the alimentary canal of ruminants in order that they may be distinguished from one another and determining as far as possible their life histories, from a knowledge of which practicable methods of preventing infection may be devised. Considerable progress has been made in this investigation, inasmuch as the principal facts in the life history of *Hæmonchus contortus*, commonly known as the stomach worm or twisted wireworm of sheep, have been established. This species, whose life history was heretofore unknown, is probably the most important of all the roundworms occurring in sheep. The eggs of the parasite are scattered over the pastures in the droppings of infested sheep or cattle. Under suitable conditions of heat and moisture they hatch in a few days, and within about two weeks the embryos develop to a stage in which they are enveloped in a cuticular sheath without openings. Prior to this stage the embryos are easily killed by freezing or drying, but after acquiring their sheath they are able to withstand continued and repeated freezing and will survive for many weeks in a dried condition. During wet weather and on dewy nights the ensheathed embryos crawl up stalks of grass or other convenient objects, ceasing their migrations when the humidity of the atmosphere falls below the point of saturation, usually coiling themselves into a spiral like a watch spring. They remain quiescent until the air again becomes moisture laden, when they resume their migrations, gradually working their way higher and higher. When grass thus infected is eaten by a sheep or other ruminant, the embryos continue their development, attaining full maturity in about three weeks. The foregoing facts are discussed more fully in Bureau Circular No. 93. Experiments are in progress to determine the necessary precautions to be taken in order to raise lambs free from parasites, particularly *Hæmonchus contortus*, the nodular worm (*Esophagostomum columbianum*), and the hookworm (*Monodontus trionocephalus*). So far the results of these experiments have been very encouraging, indicating the entire feasibility of raising sheep free from the species of parasites mentioned, and more extensive

experiments in various parts of the country in cooperation with State experiment stations and individual sheep owners are being planned.

GID IN SHEEP.

Further reports of the occurrence of the gid parasite in Montana have continued to come in since its discovery there in 1904, indicating that this dangerous parasite is becoming more prevalent in that State. In certain details the specimens of the parasite from Montana differ from specimens of European origin, and these differences, if found to be constant in all specimens, would show that the American form is of a different species or variety from that found in Europe. It is planned to investigate more fully this question of identity and to make a study of the distribution of the Montana parasite, the amount of damage caused by it, the relation of dogs and wolves to its propagation, and other points in its life history of importance from the standpoint of prophylaxis.

THE LARGE AMERICAN FLUKE IN SHEEP.

A destructive outbreak of fluke disease in a flock of sheep in Michigan during the winter was found to be due to the large fluke (*Fasciola magna*). While this parasite is common in cattle in various parts of the United States, it seems never to have been definitely reported in sheep prior to this time.

AUTOPSIES ON WILD ANIMALS.

The National Zoological Park furnishes quite an important percentage of the necropsies made by the Pathological Division. During the past year 171 animals from this source have been examined. In this collection are represented only the vertebrata, being still further limited to the series amniota. The list is pretty evenly and widely distributed among the three classes—reptilia, aves, and mammalia. If space permitted, a still further classification would be not only interesting but important for study as showing the truly comparative nature of the pathologic studies thus carried on.

The post-mortem findings reveal the following:

Not diagnosed (failure due to decomposition and other unavoidable conditions), 18; traumatisms, 5; poisoning (arsenical), 9; old age, 1; diseases, 138. Of the last number there are accredited to the digestive apparatus 52 cases, apportioned as follows:

Liver, 5 (cirrhosis, 2; fatty degeneration, 2; necrobacillosis, 1). Gastro-intestinal tract, 45 (acute indigestion, 1; gastritis, 1; gastro-enteritis, 10; gastritis and intestinal hemorrhage, 2; enteritis, 14; enteritis complicated with peritonitis, 4; infectious enteritis, 3; infectious entero-hepatitis, 1; hemorrhagic enteritis, 1; colitis, 1; ulcer-

ative colitis, 1; gangrenous intestines, 1; intussusception, 1; intestinal parasites, 3; carcinoma of the abomasum, 1). The gastrointestinal and respiratory tracts were involved together in 2 cases. Enteritis and pulmonary edema, 1; pneumonia and catarrhal enteritis, 8; pulmonary edema, 1; pneumonia and pleurisy, 2; streptococcal broncho-pneumonia, 1; verminous pneumonia, 1; lung parasites, 1; asphyxia, 1. The genito-urinary tract was involved 4 times—septic metritis and purulent peritonitis, 1; acute interstitial nephritis, 1; chronic interstitial nephritis, 2.

Bacterial diseases were specifically determined in the following 44 cases: Tuberculosis, 16 (pulmonary, 1; abdominal, 1; generalized, 14); infection with *Bacillus hydrophilus*, 2; with *B. proteus*, 17, including 1 case of infection with *B. proteus fluorescens*; infection with *B. enteritidis*, 2; with *B. pyoscedaneus*, 1; hemorrhagic septicemia, 3; septicemia, 2; septico-pyemia, 1. Mycotic disease figures six times in this list, all being cases of aspergillosis (generalized, 4, 1 by *A. flavus*, 3 by *A. fumigatus*; pulmonary, 2, both by *A. fumigatus*). There were also noted 1 case of pseudo-leukemia, 1 of double goiter, 2 of osteomalacia, and 2 of filariasis.

DISEASES OF BIRDS.

The routine post-mortem work on birds by the Pathological Division has furnished the usual variety of diseases, with here and there the occurrence of some rare form. Traumatism claimed 2, both cases being instances of a foreign body in the gizzard. One duck and 2 chickens came as samples of a rather extensive outbreak of food poisoning. Three deaths by impaction—1 of the crop, 1 of the intestines, and 1 of the oviduct—and 1 case of invagination of the intestine with consequent bacterial invasion of the whole body were noted among chickens. Four chickens revealed on necropsy an intestinal catarrh due to intestinal parasites, and 5 pigeons brought in at different times showed the presence of the air-sac mite. Protozoal diseases were represented by epithelioma contagiosa or chicken pox, 6 chickens, and infectious entero-hepatitis, 1 turkey and 1 peacock. There was 1 case of peritonitis in a chicken due to ruptured oviduct, and 11 cases of enteritis, 6 of which were cases of "going light," 3 due to infection with *Bacillus enteritidis*—1 duck and 2 pigeons. Contagious catarrh or roup was found in 4 chickens, and there were 5 cases of pneumonia (4 chickens and 1 canary), 3 cases of infection of chickens with *Bacteria sanguinarum*, and 3 cases of pulmonary congestion (2 parrots and 1 canary), 1 parrot being a case of colibacillosis.

A few cases deserve special mention, one by reason of its transmissibility to man, one for its peculiar interest to sportsmen, and one as an interesting pseudo-tuberculosis.

Besides tuberculosis there are two infectious diseases that quite frequently destroy parrots—colibacillosis and psittacosis, the latter being an infection with *Bacillus enteritidis*. One of the cases noted above as pulmonary congestion was in a parrot, the bacteriological examination of which revealed a colibacillosis. This infection being so prevalent among parrots, it may well be asked whether the early removal of fecal matter from the cage and the prevention of its mixture with the food may not be an important factor in prophylaxis. It is quite certain that those who keep parrots can not be too careful in the matter of cleanliness.

Of still greater importance is psittacosis, a virulently infectious disease of parrots due to the presence of a *Bacillus enteritidis* variant. Parrots imported into France in large numbers from the South American countries have developed this disease on the voyage, many of them dying and those that reached their destination being distributed through purchase or otherwise only to sicken with the same disease, and, further, to transmit their disease to human beings who fondled them or fed them from their own mouths or who cleaned their cages.

The development and maintenance of hunting preserves has until lately received little attention in this country. Interest in hunting is on the increase, and of necessity the number of preserves of such birds as give sport to the hunter will be likewise augmented. With this massing together in large numbers of birds and animals will come an increase in disease, or at least greater attention to the diseases of game. Grouse disease has long been known and dreaded by sportsmen in England. Various causes—damp weather, parasites, etc.—were assigned to it until Klein's work was published in 1889. He demonstrated the causative relationship of a number of the colon group of bacilli to this disease. Hitherto grouse disease has not been reported in this country, but during the past year a preserve near Washington, D. C., lost great numbers of partridges, and an investigation of the disease revealed the cause to be a bacillus identical with that recognized by Klein in grouse disease.

A most interesting form of pseudo-tuberculosis in canaries was investigated. A canary fancier who had lost several birds brought two dead birds for examination. A small-sized mass of "canker" or yellowish, cheesy, pseudo-membranous exudate was found in the mouth. The spleen was enlarged to double its usual size, quite black where the original spleen tissue could still be seen, and so studded with caseous nodules as to be literally transformed into a tuberculated mass. The liver was studded with fine yellowish spots; the lungs and the kidneys were congested. Histologic examination of the tubercular organs gave an exact reproduction of Malassez

and Vignal's tuberculoze zoogleique, while there was recovered in pure culture from these organs as well as from the blood a bacterium which in plain broth grew as a streptobacillus. This bacterium proved pathogenic for mice, guinea pigs, rabbits, and pigeons by intravenous and subcutaneous injections and by inoculation on the irritated mucous membrane of the mouth. The spleen appeared to be the chief point of attack, with the liver and lungs next in the order named. The pathologic findings were identical in both canaries and in one brought in five weeks later. In this last bird the "canker" had diminished from a large mass to a minute speck under the application of weak boric-acid solution. However, unless such cases are noted very early and treated energetically, there can be little hope, as the germ appears to be quickly transferred by the lymphatics to the viscera. Streptobacillary pseudo-tuberculosis has not been noted before in this country.

During the year pulmonary mycosis in birds, which subject was comprehensively described in the Twentieth Annual Report of this Bureau, has been observed in 6 birds (2 white Indian cranes, 2 red-head ducks, 1 ibis, and 1 loon) autopsied at the National Zoological Park. In all these cases the affection appeared very extensive, especially affecting the lungs and the air sacs. It is quite evident that the disease was contracted before the arrival of these birds at the park, as they all succumbed in from eight to twenty-five days after being received.

BEE DISEASES.

Since the latter part of the summer of 1905 the Pathological Division has been engaged in cooperative experiments with the Bureau of Entomology in the investigation of disease of the honey bee, especially black brood (foul brood of Cheshire and Cheyne). A considerable part of the work has consisted in diagnosing samples of diseased brood sent to the laboratory from various parts of the country. As a result of the examinations it would appear from the negative result of many of our cultures that there are a considerable number of combs in which the larvæ have died as a result of chilling or other causes, and yet the appearance of the comb to the naked eye so much resembles the appearance of black-brood combs that a positive diagnosis was rendered almost impossible without recourse to a bacteriological examination. *Bacillus alvei* was isolated from a number of cases, and new foci of the disease have been located, especially those at Queen, Pa., and Palestine, Ill. Attempts were made in a small colony over a period of several weeks to reproduce black brood through the feeding of pure cultures of *Bacillus alvei*, but they have not thus far proved successful.

A few specimens of bees affected with bee paralysis were examined bacteriologically, and while several organisms were isolated from the specimens, no one of them appeared regularly in the different cases. The nature of this peculiar malady will receive further study. Several cases of supposed foul brood were also received, and anaerobic and aerobic cultures were inoculated in media made from healthy bee larvæ, but no conclusions have been drawn from the limited amount of work done with the bacteria thus obtained.

EXPERIMENTS WITH DIPS AND DISINFECTANTS.

STOCK DIPS.

Extensive laboratory experiments have been made in the Biochemic Division during the past year with various forms of stock dips with the object of increasing the efficiency of the dips now used for official dipping, and also for the purpose of determining the value of dips not now permitted for official use. The standardization of dips which are as a rule made of crude materials is a difficult problem and will no doubt consume considerable time, but sufficient progress has already been made to lead us to hope that we may succeed in our attempts to increase the efficiency of stock dips and at the same time to decrease their cost. The laboratory experiments have progressed to such a point that practical field experiments based upon results obtained in the laboratory have already been started by cooperation of the Biochemic and Zoological Divisions with the South Dakota Agricultural Experiment Station. Specially prepared dips are being tried on sheep affected with scab and are also being tested by comparing their effects upon scab mites removed from their host.

An effort has been made to modify crude petroleum so as to remove the possibility of the injury to cattle which sometimes follows the use of the plain crude oil as a dip. As a result of these experiments an emulsion was devised and subsequently described in Circular No. 89 of this Bureau. Reports from field experiments indicate that when properly prepared this emulsified oil possesses the virtue of the crude oil without its injurious properties. Further experiments with the emulsion are desirable.

DISINFECTANTS.

In conjunction with the dip experiments a similar line of work has also been undertaken with disinfectants. Fair progress has been made, and a detailed report of the results will soon be submitted for publication. The experiments have so far been directed chiefly toward the determination of the relative value of cresol-soap solutions and carbolic acid as germicides, and they point very clearly to

the fact that cresol-soap solutions containing cresol in fixed proportions are more efficient germicides than carbolic acid in equal strength.

MISCELLANEOUS ZOOLOGICAL WORK.

PARASITES OF POULTRY.

The various species of tapeworms occurring in poultry in this country have been studied by the Division of Zoology, and a circular (No. 85) has been issued fully describing these forms and giving directions for treatment and prevention. Other parasites of poultry, some of them species new to science, have been studied, and the results are now being prepared for publication.

TICKS.

The study of the habits and life histories of ticks has been continued. Some unusual host relations of the Texas fever tick (*Boophilus annulatus*) were investigated and will be described in an article soon to be published.^a Some experiments with the chicken tick (*Argas miniatus*) were begun during the summer of 1905, with the special view of determining its relation to the so-called "tick disease" of chickens in the South, which is probably identical with the tick-borne spirillosis of South American chickens.

COLLECTION AND IDENTIFICATION OF PARASITES.

A large number of parasites have been collected at the autopsies of various domestic and wild animals, and numerous specimens sent in by correspondents have been identified.

INDEX-CATALOGUE OF MEDICAL AND VETERINARY ZOOLOGY.

The work on the card index has been continued during the year, and five parts of the Index-Catalogue of Medical and Veterinary Zoology, Bulletin 39, comprising the K and L authors, have been published.

SUPERVISION OF PEDIGREE RECORD ASSOCIATIONS.

A radical change has been made in the regulations of the Government regarding the importation of animals for breeding purposes. Heretofore the pedigree certificate of animals imported for breeding purposes had to show registration of sires and grandams. This requirement caused endless complaint from importers, and has been

^a This article has since appeared as Circular 98 of the Bureau of Animal Industry.

maintained only because the Department felt that in no other way could there be a reasonable assurance of pure breeding. Without a closer supervision of the books of record a more lenient requirement would be impracticable.

To improve the situation the Bureau considered the advisability of placing on the American herdbook secretaries the responsibility for the pure breeding of animals imported for breeding purposes, and requiring registration in an American book of record as the only evidence necessary to pass a breeding animal through the customs free of duty. Before taking definite action, however, the sentiment of the secretaries of American pedigree record associations was ascertained, and it was found that the great majority of them were in favor of such a change. Accordingly Bureau of Animal Industry Order No. 130 was revised and replaced with Bureau of Animal Industry Order No. 136, to take effect July 1, 1906. The new order requires all animals imported for breeding purposes to be registered in an American book of record before free entry will be permitted. The certificate of a custodian of such book of record that the animal is purebred and has been registered is all that is necessary for free entry. Where a breed has no book of record in the United States, the certificate of the Chief of the Bureau of Animal Industry must be obtained before the animals are passed free. A herdbook assistant to the Animal Husbandman of the Bureau has been appointed to devote his entire time to the work of supervising the certified American associations and the examination of pedigrees submitted to the Bureau for approval.

This change is a very important one and should result in good to the breeding industry. It will not only make secretaries more careful in the registration of imported animals, but will compel importers to register such animals, which has not been done in all cases, particularly with horses. If an imported animal is not registered, the breeding of its progeny is difficult and often impossible to establish, and therefore the intent of the law is nullified. But little objection has come to the Department from importers, and this has been largely from importers of horses, who claim that the fact that horses are not quarantined will make it difficult to get American certificates to the port of entry as soon as importations land; but this difficulty can probably be readily remedied. An importer can mail his foreign certificates to the American secretary far enough in advance of sailing to allow that officer time to record them and issue his own certificates and get them to the importer on landing.

The other features of the former regulations (Bureau of Animal Industry Order No. 130) are retained in substantially the same form.

The following numbers of books of record were on the certified list July 1, 1906:

	American books of record.	Foreign books of record.
Cattle.....	14	24
Horses.....	19	22
Asses.....	1	
Sheep.....	20	13
Hogs.....	12	2
Dogs.....	1	4
Cats.....	2	1
Total	69	66

BREEDING INVESTIGATIONS.

HORSE BREEDING.

The horse-breeding work at the Colorado Experiment Station is progressing very satisfactorily. The stallion Carmon was bred to 26 mares in 1905, and got 24 in foal at the first service. His first crop of foals came last spring, and, while it is too early to pass an opinion on them, it can be said that they prove the horse to be a good investment as a sire. The stud has been increased by the purchase of two mares in Kentucky—one an inbred Mambrino King mare, and the other by Chester Dare out of a daughter of Harrison Chief. We have already some Harrison Chief blood among the mares in Colorado, but this is the first introduction of that of Mambrino King, unless the claim can still be made that Mambrino King was a grandson of Mambrino Chief, whose blood we have in considerable abundance. The female line from Harrison Chief is one of the most valuable known for the production of quality, style, and good conformation, and Mambrino King was one of the handsomest horses ever seen in an American show ring. For these reasons these mares should be of great value in the breeding work.

These purchases should be followed by others. There are probably a number of mares in the Colorado stud which will have to be discarded eventually as unfit for breeding purposes, and these should be replaced by others. Further, 20 mares is too small a number with which to do satisfactory work. The number should be increased. The experiment in breeding carriage horses has attracted the attention of the entire country and has caused much interest in the intrinsic value of the American horse. The Department has started a line of work which it is believed will be of the greatest value to American stockmen, and it should follow it up systematically and thoroughly. It is not the intention to recommend that the work should be increased to a point where it may become burdensome to the station, but the Department should be ready to purchase

exceptionally good mares as opportunity offers, even if the number is increased beyond 20.

Work in breeding Morgan horses, in cooperation with the Vermont Experiment Station, was begun in June with the purchase of 7 mares and 2 fillies in Vermont and 2 mares in Kentucky. The object of this work is to prevent the loss of the Morgan blood and preserve the type, at the same time increasing the size over that of the old Morgan. The mares were bought by a board composed of Prof. C. F. Curtiss, director of the Iowa Experiment Station; Mr. Cassius Peck, of the Vermont Experiment Station, and Mr. George M. Rommel, the Animal Husbandman of this Bureau. The board was very fortunate in securing mares of good size, uniformity, and quality, and strongly bred in Morgan line. The mares purchased in Vermont were sired by General Gates, Denning Allen, Bob Morgan, Young Ethan Allen (a full brother of Daniel Lambert), Rocky Mountain, and Gillig. Those bought in Kentucky were sired by Harrison Chief out of Morgan dams, and give a combination of blood lines which is of the greatest value.

The extension of the work in horse breeding is a matter of the highest importance. In Vermont it is doubtful whether the resources of the station will permit an extension beyond what will come from the natural increase of the stud. In Colorado, however, the station is anxious to increase the number of mares materially, and the sentiment of the stockmen of the State is in harmony with the station's attitude.

A more important extension can and should be made by establishing experiments in Kentucky. Nowhere can the same amount of useful and valuable material be found. It is the center of the light horse breeding industry of the country; more carriage horses come from there than from any other State in the Union, and the project to establish a breed of American carriage horses will never be complete until the advantages of Kentucky are realized. The importance of this step warrants an increase in the appropriation for this purpose.

BREEDING ZEBRA HYBRIDS.

Unfortunately no progress whatever has been made in the breeding of hybrids between the Grévy zebra and the mare. The Zoological Park has not been able to breed the large zebra to mares, and a younger male, presented to the Department by Ras Makonnen, governor of Harrar, Abyssinia, through the courtesy of Hon. R. P. Skinner, consul-general at Marseille, broke his neck the first day he was turned out last spring by running into a woven-wire fence. The consent of the President has been obtained to use the large Grévy

zebra at the Bureau Experiment Station. Quarters are being arranged and will soon be ready for occupancy.

FECUNDITY OF POLAND-CHINA AND DUROC-JERSEY SOWS.

An investigation of the fecundity of Poland-China sows was made by the Animal Husbandman of the Bureau, and the results were published in Circular No. 95 of the Bureau series. A similar investigation of the fecundity of Duroc-Jersey sows was included.

Results for Poland-Chinas were compiled from the American and the Ohio (now the National) Poland-China Records for the years 1882-1886 and 1898-1902. The total number of litters for the earlier period was 14,703 for the two records combined, and for the later period 39,812. The average number of pigs per litter for the earlier period was found to be 7.04 and for the later period 7.52, an increase of 0.48 per litter. The increase was somewhat greater in the American Poland-China Record than in the Ohio. These results are contrary to popular opinion regarding this breed, and show that the charges of diminishing fecundity are without warrant when a comprehensive number of litters is considered. They also show the value of the system used by the hog breeders' associations in requiring breeders to report the number of pigs farrowed in each litter, as it gives breeders data with which to increase the fertility of their herds.

The records for Duroc-Jersey sows could not be compiled for so long a period of time, only ten years being available with a comprehensive number of litters. The first five years (1893-1897) show an average size litter of 9.22, and the five-year period 1898-1902 an average size of litter of 9.27. The results for 1893 seemed to be abnormal, and if omitted there is a decrease of 0.01 per litter, too small to be of practical value. The results confirm popular opinion that Duroc-Jersey sows are more prolific than Poland-Chinas.

These investigations are being followed with studies of the inheritance of fecundity. Some results have already been obtained which show that the size of litter is affected, in part at least, by maternal inheritance and that the size of litter increases with the age and maturity of sows.

POULTRY BREEDING.

The cooperative investigations in poultry breeding at the Maine and Rhode Island experiment stations have been continued during the year. In Maine the principal object is to increase the egg-laying capacity of the flock of chickens. Already several hens have been found to lay more than 200 eggs in one year, and the results seem to indicate that the average egg yield of a flock can be increased by selection. A bulletin describing the methods used and the results so far obtained in this work has been prepared for publication.^a

In the Rhode Island experiments an effort is being made to breed turkeys that will be resistant to the disease commonly known as black-head.

BREEDING EXPERIMENTS WITH SMALL ANIMALS.

Arrangements have been made to begin investigations in animal breeding by collaboration between the Animal Husbandry Office and the Experiment Station of the Bureau, using for this work the large stock of guinea pigs, rabbits, and other small animals at the station. Experiments to determine the effects of inbreeding will be started at once, and studies will later be made of crossbreeding.

FEEDING INVESTIGATIONS.

COOPERATIVE INVESTIGATIONS IN ANIMAL NUTRITION.

Investigations in animal nutrition in cooperation with the Pennsylvania Experiment Station were undertaken in 1898, when the construction of a respiration calorimeter for domestic animals was begun. The completion of this large and complicated apparatus occupied fully three years, the first experiments with animals having been conducted in the winter of 1901-2 and work having been continued up to the present time. These investigations are in charge of Prof. H. P. Armsby, director of the Pennsylvania station.

The investigations constitute a careful, scientific study of the fundamental principles of animal nutrition. Starting with the food as a source of energy to the animal machine, they follow this energy through to its ultimate effect, determining how much escapes in the undigested residues of the food, how much is expended in the digestion and assimilation of the food, and what surplus remains to sustain the life of the animal or enable it to produce meat, milk, or work. The investigations are complicated, requiring the services of not less than seven men for the actual conduct of an experiment, and involve in addition a large amount of laboratory work and extensive computations. Hence it is not strange that the results seem slow in accumulating. The results thus far published include experiments upon timothy hay, red-clover hay, and corn meal, as to their relative values both for maintenance and for productive purposes. An outline of the results obtained has been published in Bulletin No. 74 of the Bureau of Animal Industry and in Bulletin 71 (revised) of the Pennsylvania station.

More important than the mere numerical results, however, has been the aid which the experiments have afforded in clearing up some fundamental points regarding the energy relations between the food and the animal. At the time when these investigations were begun the prevailing ideas were based largely on Rubner's earlier investi-

gations, which were popularized in the United States by the writings of Atwater. It was then supposed that the so-called "fuel values" of feeding stuffs—that is, the amount of heat which they were capable of giving off in the body—was a measure of their nutritive value, and Rubner's factors for the fuel values of human food were used quite generally to compute the fuel values of the digestible nutrients of stock foods, a proceeding natural enough at that time, but which unfortunately seems to have proved less susceptible to change than the ideas on which it was based.

The investigations of Kellner in Germany and those at the Pennsylvania Experiment Station have amply demonstrated that this conception was erroneous, and that the real values of stock feeds are much less than their fuel values. That this should be true in the fattening or milk-producing animal is not so surprising, but that it should prove to be the case on a simple maintenance ration compels a material modification of our general conceptions and is of fundamental importance to the theory of the subject. The Pennsylvania experiments have shown, in the first place, that the real fuel values of stock feeds are less than the computed ones, and that, moreover, but a fraction of the real fuel value of stock feeds is utilized for any purpose in the body. In the three cases thus far investigated the real values for maintenance were found to range from 56 per cent of the fuel value computed from the digestible nutrients in the case of timothy hay to 67 per cent in the case of corn meal. On the basis of the digestible nutrients, 174 pounds of timothy hay appeared to be equal to 100 of corn meal for maintenance, while in reality 211 pounds were required. For fattening, the discrepancy was still greater, 275 pounds of timothy hay being required to equal 100 of corn meal.

A series of experiments designed to study what effect the age and breed of the animal has upon the percentage of food energy utilized has now been in progress for two years, but the results are not yet sufficiently complete for publication. Later it is hoped that more extended data regarding the actual values of other feeding stuffs may be secured.

FEEDING COTTON-SEED PRODUCTS TO HOGS.

Experiments in feeding hogs with cotton seed and cotton-seed meal have been conducted at the quarantine station at Halethorp, Md., during the year by the Animal Husbandry Office, in collaboration with the Pathological and Biochemic Divisions, to test the poisonous qualities of these feeds. Hogs have been killed with cotton seed, cotton-seed meal which had been cooked, and ordinary choice commercial meal. When a varied ration was given in addition to cotton-seed meal death did not result so soon as where only one grain was

fed. Bran and middlings were found to be little better than corn meal. Experiment-station results with corn meal have been confirmed, hogs dying in about four weeks from the time feeding cotton-seed meal commenced.

Post-mortem examinations developed the fact that many of the hogs die with very constant and characteristic lesions of the internal organs, viz, a severe hemorrhagic gastro-enteritis, congestion of the liver with parenchymatous degeneration, edema of the lungs, cloudy swelling of the kidneys, and oftentimes a well-marked dropsical effusion in the pectoral and peritoneal cavities, and occasionally in the pericardial sac. The effusion is occasionally light red in color, and in most cases contains fibrous shreds, which cling to the visceral organs. The edema of the lungs is a very constant and marked lesion. Ulcerations or erosions of the gastric and intestinal mucosa are seen in the severest cases, and in long-standing cases emaciation is quite noticeable.

The experiment with bran and middlings will be repeated, and tests with fermented meal will be begun.

The Bureau is now in a position to raise its own hogs for this work, which will be a great advantage. Seven sows were bred last spring, the Maryland Experiment Station courteously giving the use of its herd boar. The Bureau has bought a boar pig, which will be used this fall, and a large number of sows will be bred.

BEEF PRODUCTION IN THE SOUTH.

The work in beef production in cooperation with the Alabama Experiment Station has been broadened by taking up collaborative work with Mr. John S. Kernachan, of Florence, Ala., who owns a large farm on the Tennessee River and for some years has been grading up from native cows by means of purebred Angus bulls. The experiment station is keeping records of his herd, under the direction of the Bureau, and undoubtedly good results can be obtained for southern farmers by showing the possibilities of beef production under farming conditions.

DIGESTION EXPERIMENTS WITH POULTRY.

The feeding portion of the second series of digestion experiments with chickens, conducted by the Biochemic Division, was practically completed during the previous fiscal year, but the analytical chemical work required by the experiments was very great and has only recently been finished. The results should be ready for publication within a few months.

This second series comprises thirty-six individual experiments with corn, oats, and wheat, fed singly and in combination with each other, as well as with green feed.

WORK IN THE INTEREST OF THE DAIRY INDUSTRY.

During the year the work of the Dairy Division has been systematized and subdivided as follows: Butter investigations, market milk investigations, cheese investigations, southern dairy investigations, building and management investigations, laboratories, inspection of renovated-butter factories, and inspection of renovated butter in the markets. Each of these lines of work has been placed under the direction of an expert, the chief of the division, Mr. Ed. H. Webster, being personally in charge of the butter investigations, and the assistant chief, Mr. C. B. Lane, of the market milk investigations.

BUTTER INVESTIGATIONS.

In the latter part of the fiscal year 1905 plans were laid for extended investigations in the manufacture and storage of butter, with the object of rendering practical assistance to the butter-making industry by solving some of the difficulties encountered in the trade. This work was begun in June, 1905, and the first series of experiments continued throughout the fiscal year 1906. These experiments consisted in carrying in cold storage for several months, under varying conditions of temperature and storage, butter made under different conditions. The butter—about 5,000 pounds—was made at Monticello, Iowa, and Topeka, Kans., and placed in storage in Chicago, and was examined and scored during and at the end of the storage period.

Some of the questions as to which these tests were expected to give results were (1) the effect of pasteurization, (2) the amount of salt to be used, (3) temperature of storage rooms, (4) the use of cans hermetically sealed for storing butter, (5) the keeping quality of good compared with poor butter, and (6) the action of air in contact with butter in storage.

The butter was made from five lots of cream, three of which were sour when received at the creamery and two sweet. From each lot of cream two lots of butter were made, one pasteurized and the other unpasteurized, and part of each lot of butter was lightly salted and part heavily salted. The butter was packed in tubs and cans, some of the cans being only partly filled, so as to test the effect of air. It was then stored at temperatures -10° , $+10^{\circ}$, and $+32^{\circ}$ F., and at variable temperatures, part of each lot being stored at each temperature. The butter remained in storage about eight months.

The results showed that butter containing low percentages of salt kept better than butter of the same lot containing higher percentages of salt. Butter in full cans and in tubs at the lower temperatures scored about the same. At the higher temperature there was a slight

difference in favor of cans. Butter in full cans kept better than that in cans only partially full. On the whole, butter held at the lowest temperature kept best, both when in storage and after removal from storage. Butter made from cream received sweet kept well while stored at the two lower temperatures, and also after removal from storage, giving results wholly satisfactory. Butter made from cream received sour also kept well at the lower temperatures, but deteriorated rapidly after removal from storage, giving, on the whole, results which were very unsatisfactory. The conclusion is that light salting and low temperatures and the use of cream received at the creamery in a sweet condition give much the best results for storage butter.

A report giving the details of this experiment has been published as Bulletin No. 84 in the Bureau series.

The second series of experiments in the manufacture and storage of butter, which has not been completed, consists in the making of a quantity of butter at the Wisconsin Experiment Station and its storage in Chicago. Arrangements were made for the use of the Wisconsin station laboratories for the necessary bacteriological and chemical work.

Another unfinished line of work is the investigation in northern Wisconsin and Minnesota of the cause of fishy flavor in butter. The development of a fishy flavor in butter has been a source of trouble, and whenever reports were received that creameries were having this trouble an investigation was made with a view to discovering the cause, if possible.

A temporary laboratory was established at Bloomer, Wis., and large numbers of cream samples were tested bacteriologically and test churnings of butter made. While the cause of the fishy flavor has not yet been discovered, a number of probable causes have been eliminated, and a good foundation has been laid for continuing the work during the coming year.

Incidental to the last-mentioned investigations, studies were made of the cause and methods of prevention of mold in butter tubs. Experiments were conducted at points in Minnesota and Wisconsin and continued at the Iowa Experiment Station. Coating the tubs with paraffin was found to be the best method of prevention. A report of these researches has been written and will soon be published.*

A study of the conditions that existed in the market regarding the sale of butter convinced the officers of the Dairy Division that something should be done to assist the butter makers in producing a better quality of butter than seemed to be finding its way to the

* Since published as Bulletin 89 of the Bureau.

markets. The work done by the State dairy and food commissioners and their field men indicated very strongly that there was such a need. Inspectors of the Dairy Division would visit a creamery and perhaps find everything apparently all right; they would see only the fresh butter. When this butter reached the markets, however, some ten days or two weeks later, it was very often found to be deficient in some respect. In order to bridge over this gap which seemed to exist between the factory inspection and the receipt of the butter on the market, an inspector was appointed in April to examine the poorer qualities of butter entering the New York market. This work was begun as an experiment to determine if some assistance could not be rendered to the creameries by giving them exact information as to the condition of their butter on its arrival in the market. The work proved so advantageous that the butter board in Chicago requested the appointment of a similar officer for that market, and this request has been complied with. A system of reporting has been organized by which a statement of the condition of the butter is sent to the butter maker, a copy of it filed with the butter dealer who purchases this butter, and another copy sent to the office of the dairy and food commissioner of the State in which the creamery is located, for the use of his field inspectors. The dairy and food departments, particularly in Michigan, Minnesota, and Iowa, have indicated their desire to cooperate with the Federal Department of Agriculture in making this work a complete success.

CHEESE INVESTIGATIONS.

The investigations in the manufacture of soft cheese at Storrs, Conn., in cooperation with the Storrs Experiment Station, have been continued throughout the year. During the winter Dr. Charles Thom, mycologist connected with this work, spent two months abroad studying the manufacture of cheese in England, France, Germany, Switzerland, and Italy, and these studies have resulted in marked progress in the investigations concerning the manufacture of Camembert and Roquefort cheese. A bulletin (No. 82) dealing with the fungi which have to do with the ripening of these cheeses was issued during the year. The knowledge so far gained of these fungi and of the methods used and the conditions necessary in the manufacture of such cheeses indicates that it will be practicable to produce in this country soft cheeses of these types fully equal to the best European product, though there are some problems yet to be studied.

A study was made of the conditions surrounding the manufacture, storage, and sale of American Cheddar style cheese throughout the cheese manufacturing section of the country. During these investigations a locality was selected in which to make cheese for experimental curing and storage. A satisfactory place was found at Ply-

mouth, Wis., where storage rooms suited to the needs of the work were secured, and a cheese factory about 3 miles from the town was induced to cooperate with the Dairy Division in the manufacture of cheese for storage. Mr. C. F. Doane, expert in charge of cheese investigations, spent three months in the summer of 1905 at this place, making cheese and studying the conditions in that part of Wisconsin. Between 2,000 and 3,000 pounds of cheese were placed in storage under different conditions of make and storage temperature.

In these experiments the usual amount of rennet, 3 ounces to 1,000 pounds of milk, was used for one-half of the cheeses, and twice the amount, or 6 ounces of rennet to 1,000 pounds of milk, was used for the other half. Two cheeses of each day's make were stored immediately in the curing room having a temperature of 32° F., two in the curing room at 40° F., and two were cured in the factory curing room at about 65° F. Other cheeses were held one week to two weeks after making and were then stored at 32° and 40° F. In the case of both the low-rennet and the high-rennet cheese, that cured at 32° F. directly from the press scored highest, the average being 95 and 94.4 points, respectively, out of a possible 100. The cheese scoring lowest in each case was that cured entirely in the factory curing room at about 65° F. It was also shown in these investigations that taints develop more noticeably in the factory curing room than in cold storage, and that taints and acidity were checked more by storage at 32° F. than at 40° F. It appears also that cold curing derives its value chiefly from its effect on what otherwise might be poor cheese. In view of the growth of the popular taste toward mild cheese it appears that the time is soon coming when all cheese, if ripened at all, must be ripened at low temperatures, and the sooner it is put into cold storage the better.

The details of these experiments, together with a digest of previous work on the same subject, have been published in Bulletin No. 85 of this Bureau. There was also published during the year a report on experiments in cold storage of cheese conducted by the Dairy Division in 1903-4.^a

The work at Plymouth and vicinity showed the need of a much larger and more comprehensive study into the methods of manufacture, ripening, and storage of American Cheddar style cheese, and toward the close of the year arrangements were made with the Wisconsin Experiment Station at Madison for cooperative work of this character, the station to furnish the services of an expert chemist and of an experimental maker. Cheese will be purchased on the open market and placed in storage, and cheese manufactured under known conditions will be placed in storage.

^a Bureau of Animal Industry Bulletin 83.

The Dairy Division is cooperating with the Office of Experiment Stations of the Department in investigations as to the digestibility of Cheddar style cheese. The work has been conducted at Middletown, Conn., and will be continued for another year. It is hoped that these investigations will have a practical bearing upon the use of cheese as a food by the American people.

MARKET MILK INVESTIGATIONS.

During the year a study of the various markets was made and a bulletin was published on "The Milk Supply of Boston, New York, and Philadelphia."^a Investigations and studies were also started concerning the production, delivery, and distribution of market milk and the organization and working of milk sanitary commissions and other organizations tending to improve the quality of market milk. Plans are under way for organizing some system of scoring and registering dairies.

During the National Dairy Show in Chicago in February the Dairy Division conducted an exhibit of milk and cream. Samples were secured from 13 different States and from 45 different producers. Medals were awarded by the show association, and diplomas were given by the Department of Agriculture, for the exhibits which scored highest and kept best. This work attracted a great deal of attention and has stimulated a desire in a number of States to inaugurate systems of scoring milk and cream. A report has been prepared for publication as a bulletin of the Bureau.^b

During the year circulars were sent out to about 2,500 American cities asking for information concerning the milk supply and the regulations governing the distribution and sale of milk. About 1,400 replies were received, containing a great deal of material that will be useful in advancing the cause of good milk.

SOUTHERN DAIRY INVESTIGATIONS.

The first work in connection with the investigations of southern dairying was to make a careful survey of the present conditions in the South. With this in view, various States were visited by Mr. B. H. Rawl, who is in charge of this work, and conditions existing in the towns and surrounding country were studied. Ample notes of these conditions were taken with a view to determining the best course for future work to improve conditions and promote the dairy interests.

This preliminary work has developed the following facts: In some cases herds were found producing as good results as are ordinarily expected in any section of America. At other places milk was pro-

^a Bureau of Animal Industry Bulletin 81.

^b Bulletin 87.

duced as cheaply as in any dairy section in the country. On the whole there was an enormous demand for dairy products. Almost all butter and cheese was obtained from other sections, some cream being shipped a great distance. Condensed milk and cream find a great market throughout all the southern cities. Silage is used to a very limited extent in the South, but in a few isolated cases silos were found to contain an excellent quality of silage. One of the great drawbacks to dairying in the South is the inferior grade of cattle found there. They are mostly descendants of the Jersey breed, but lack altogether any quality that characterizes that breed. It is probable that this poor quality of dairy stock is due, in large part, to the fact that the live-stock industry has been made unprofitable because of the presence of the cattle tick and the infection of Texas fever. The southern dairyman does not know how to grow feeds cheaply for dairy feeding. In many cases the feeds that he has at hand are not used to advantage because of lack of knowledge of the proper feeding methods. There is great need throughout the South for education in improved methods of dairy breeding and feeding and milk production.

The investigations so far have shown that there is a great desire on the part of many southern people to know more about dairying. They are anxious for something that will enable them to get away from the one-crop system. The action of Congress in appropriating \$20,000 for the extension of this work during the fiscal year 1907 indicates that its importance is beginning to be realized.

DAIRY BUILDING AND MANAGEMENT INVESTIGATIONS.

The large number of inquiries that come to the Dairy Division for assistance in designing and constructing modern improved dairy barns and other dairy buildings resulted in the taking up of the study of buildings of this character. Circulars were issued stating that the Division was prepared to give assistance to a limited number of applicants for plans for barns and other dairy buildings, and many inquiries were received as a result. A large number of plans have been worked out and sent to farmers throughout the country. More have been sent to dairymen in the South than to any other section, though applications have come from every State in the Union.

The subject of silo construction has also received considerable attention. In August, 1905, three silos, representing three distinct types of construction, were built on different farms in the same neighborhood at Easley, S. C. They were built by the owners, under the supervision of the Dairy Division. One of these silos was of an entirely new form of construction, originated by Mr. G. H. Parks, the division architect, which it is believed will prove to be very satis-

factory. It consists of expanded metal, of a gauge sufficiently strong to withstand the pressure of the silage, and cement. The sheets of expanded metal were nailed to temporary studs and the lapping ends securely wired together. The inside was then plastered with 2 inches of cement and the temporary studs removed, after which the outside was covered with about one-half to 1 inch, completing a wall from $2\frac{1}{2}$ to 3 inches in thickness. As the silo was only partially filled the first winter, no conclusions as to the reliability of this construction have been drawn.

Another of these silos was built on what is known as the modified Wisconsin plan, which is described in publications of the Wisconsin Experiment Station and of many other stations. The third silo is known as the stave silo. In the latter a slight departure from the regular method of construction was made. The staves were spiked to each other at intervals of about 5 feet, so that the structure stood solid and firm even before the hoops were placed upon it. It is believed that this method of spiking the staves together is superior to the old method of putting up tongued and grooved staves.

It is the intention to study these three forms of silo as to their durability and practicability. Applications were received during the year for specifications and directions for building more than 75 silos in the South.

A circular (No. 90) giving a plan for a modern dairy barn, with suggestions that would enable a builder to use the ideas embodied in this structure in any form of barn he might wish to build, was issued during the winter and a large number of copies were distributed at the dairy show in Chicago in February. This circular was copied by nearly all the agricultural papers of the country and received favorable comment. Plans are gradually being worked out for a more complete publication concerning barn and silo construction.

Investigations into the management of creameries and cheese factories are being undertaken. The principal creamery and cheese sections of the country will be visited and the business features of the industries studied, including the organization of the creamery or cheese factory company, the equipment of such establishments, the kinds of buildings used, etc. The object of this line of work is to enable the Dairy Division to give expert information along these lines to those who desire it.

DAIRY LABORATORIES.

The Dairy Division has not heretofore maintained a dairy laboratory in Washington, the necessary laboratory work having been done in other laboratories of the Department or at experiment stations. It was decided, however, in the latter part of the fiscal year to estab-

lish a laboratory for the Dairy Division in Washington, and two rooms of the building used by the division were set aside and are being fitted up for this purpose.

RENOVATED BUTTER INSPECTION.

The inspection of renovated butter and of the factories producing the same, under the law of May 9, 1902, has been continued. During the twelve months ending June 30, 1906, 374 inspections were made at 67 factories, making an average of $5\frac{1}{2}$ visits to a factory, the greatest number of inspections made at any one factory being 9. These factories produced during the fiscal year 53,795,321 pounds of renovated butter, as against 60,164,783 during the previous year. During the fiscal year 1906 the following amounts of renovated butter were inspected for export: At Chicago, 6,353,881 pounds; at New York, 4,184,118 pounds, and at Boston, 467,538 pounds, a total of 11,005,537 pounds.

The general sanitary condition of factories has improved materially from past years, and there are fewer violations of regulations in regard to the affixing of labels and stamps as prescribed by the law and the regulations of the Department. As a rule the factory men are endeavoring to the best of their ability to comply with the law and the regulations.

Renovated butter has also been inspected in the markets with a view to detecting violations of the law and regulations. On evidence obtained by inspectors two prosecutions were brought against a dealer, which resulted in his conviction in both cases, a fine being imposed in one and both fine and imprisonment in the other. The court decisions sustained the rules and regulations of the Department of Agriculture in so far as they applied to the cases in hand.

Samples were collected in a number of cities where renovated butter was found to be sold in an illegal manner, and cases have been prepared for prosecution against two wholesale dealers in renovated butter for removing the marks, stamps, labels, etc., and putting the goods on the market under deceptive names. These cases have not yet been brought to trial. It is believed, however, that there will be no further question as to the right of the Department to control the way in which renovated butter shall be sold upon the open market, so as to prevent fraud upon the purchaser and the consumer.

FUTURE DAIRY WORK.

The lines of work already under way should be continued and several of them extended. For instance, it is proposed to take up the study of Swiss cheese in addition to the other European varieties now being investigated, and the southern dairy investigations should

be enlarged as the work progresses. The building and management investigations have only begun.

The Dairy Division has been able to make but little headway during the year toward indexing dairy literature as proposed in the report for the previous year, but plans are made for carrying out the project. A comprehensive index of dairy literature would be of great value and assistance in the work of the division and to dairy writers and investigators, as there is no such index in existence.

The efforts of the Dairy Division so far have been mainly along the line of the handling and marketing of milk and the manufacture of milk products. The whole subjects of dairy husbandry, the production of milk, the influence of breed and feed on quality and quantity of milk, the encouragement of farmers to know more about their stock, and other important lines of work, are as yet untouched by the division, except that a beginning has been made for the year 1907 in the study of milk as it may be affected by the period of lactation and the breed of the cow.

Two new lines of work are planned to be undertaken during the fiscal year of 1908—namely, investigations in milk production and in the manufacture of condensed milk and cream.

In order to extend the present work and to take up the new lines of work that are indicated, a considerable increase in the amount of appropriation available for the Dairy Division will be necessary.

PUBLICATIONS.

Several of the publications issued or prepared during the fiscal year have already been mentioned. Besides these, the Twenty-first Annual Report of the Bureau for 1904 was issued, and the Twenty-second Annual Report (1905) was prepared for publication. These annual reports are volumes of several hundred pages, containing special articles and miscellaneous information relating to the livestock industry and the work of the Bureau. Among other important publications prepared during the year are a bulletin on Tuberculosis of the Food-Producing Animals, by Dr. D. E. Salmon (this work having been undertaken while he was Chief of the Bureau and only recently completed), and a revision of Bulletin No. 27, Information Concerning the Angora Goat, made in pursuance of a resolution of Congress.

The new publications issued by the Bureau during the twelve months ending June 30, 1906, were 70 in number, consisting of the Twenty-first Annual Report of the Bureau, the annual report of the Chief, 13 bulletins, 19 circulars, 3 Farmers' Bulletins, 31 orders and regulations, and 2 Yearbook papers, aggregating 2,099 printed pages.

NEEDS OF THE BUREAU EXPERIMENT STATION.

The work required of the Experiment Station has increased until the facilities, both as to laboratory and field room, have become inadequate. The addition of a second story to the laboratory building is greatly needed, and there is some doubt as to whether the current appropriation act confers authority for such work or for the erection of new structures of any kind. More land is also needed, not only to allow room for the proper arrangement and separation of animals under experiment with contagious diseases, but to provide for the production of green forage for the animals, which are necessarily confined to small paddocks. Increased space would lessen the danger of the accidental spread of contagion, as well as effect a large saving in feed bills, and the purchase of additional land is therefore considered the part of wisdom and economy. I recommend that Congress be asked for authority for such purchase, also for authority to make alterations to existing buildings and to erect new structures as necessity may arise.

PROPOSED EXPERIMENTAL FARM FOR BREEDING, FEEDING, AND DAIRY INVESTIGATIONS.

As the work in animal breeding and feeding progresses it becomes evident that the Bureau will need an experimental farm near Washington for investigations of this class, aside from the cooperative work being done with the State experiment stations. Experiments in breeding and feeding have been carried on in a small way at one of the Bureau quarantine stations and at the Bureau Experiment Station for contagious diseases, but it is obviously very undesirable and unwise to keep animals for experiments of this kind on the same premises where animals are undergoing quarantine or where experiments are being made with contagious diseases. It therefore seems that the time is soon coming when the Bureau should be provided with a separate farm for investigations in breeding and feeding live stock and in dairying.

THE FEDERAL MEAT-INSPECTION SERVICE.

By A. D. MELVIN, D. V. S.,
Chief of the Bureau of Animal Industry.

THE IMPORTANCE OF MEAT AS A FOOD.

Meat forms a larger part of the food of the people of this country than is the case with any other country except Australia. Two recent estimates in this Department^a have placed the total consumption of meat (in terms of dressed weight) in the United States for the last census year (1900) at 13,611,703,000 pounds and 14,116,886,000 pounds, respectively. The first of these does not include lard, while the other does. These estimates represent a per capita consumption of 179 pounds in the one case and 186 pounds in the other. It is calculated that meat constitutes about 30 per cent of our total nutritive material and costs about 30 per cent of the total.

THE OBJECT OF MEAT INSPECTION.

Meat animals are subject to many diseases which impair or destroy the wholesomeness of their meat as human food, but the presence or the effects of disease are not always discernible in the dressed carcass. A piece of meat may carry the germs of a dangerous disease without giving any indication of this fact to the consumer. To detect disease there should be an expert inspection at the time of slaughter.

To protect the people at a point where they are unable to protect themselves is, generally speaking, the object of meat inspection. Diseased meat is the direct cause of disease in those who eat it. The consumer, being himself unable to determine whether or not the meat he buys is diseased, demands that he be protected by the Government from the cupidity or ignorance, or both, of those from whom he buys.

Let us consider, then, the importance of maintaining over this large and expensive portion of the food of the people—a portion that is subject to diseases that the people themselves can not discover—a constant vigilance by men able from long study and training to detect such diseases where the layman sees nothing unusual.

^a Twenty-second Annual Report, Bureau of Animal Industry (1905), page 283, and Bulletin 55, Bureau of Statistics.

Since before the time of Moses the necessity of an official meat inspection has been recognized. Without going into the history of enactments by tribes, by municipalities, States, and national governments, it may be said that meat-inspection legislation has more or less kept abreast of increasing knowledge, and that, although Federal legislation in this country has not at all times kept even pace with science, the present law is as advanced a measure as the medical profession and sanitarians demand, and is, perhaps, the most stringent and far-reaching of existing laws on the subject.

DEVELOPMENT OF THE PACKING INDUSTRY.

Meat inspection in the United States falls naturally into three periods: (1) From the opening of the Union Stock Yards in Chicago in 1865 to the year 1890, when the first Federal meat-inspection law was passed; (2) from the latter year until the passage of the law of 1906, and (3) from then until the present time.

By the year 1851 the packing industry had become firmly established in Chicago, and it grew steadily until in 1865 the several railroad companies centering in Chicago and some of the managers of the small stock yards agreed to combine for the building of the Union Stock Yards, which were opened on Christmas Day of that year. Meat packing had by that time also become an important part of the business of Kansas City, St. Louis, Omaha, St. Joseph, and Cincinnati. An idea of the growth of the industry may be gathered from the increase in the number of cattle received in Chicago. From 1851 until the building of the Union Stock Yards the total number of cattle received in Chicago was 1,691,410; of these 566,379 went to the packing houses, of which number 291,035 were consumed in the city. In the succeeding twenty years the number of cattle received was 20,024,774, of which 7,000,000 were slaughtered in Chicago. In 1906 the number of cattle received was 3,329,250, of which nearly 2,000,000 were slaughtered.

With the establishment of the Union Stock Yards meat packing was reduced more to a system, and it is recorded that the city health authorities instituted an inspection of the packing houses, an inspector being stationed at each of the two gates through which animals passed from the railroad on their way to the stock pens. These health officers were "practical butchers whose experience enabled them readily to detect any cattle or hogs that might be suffering from disease or were not fit for human food."

The first statistics of cattle inspection were compiled in 1881, when of nearly 2,000,000 cattle inspected for slaughter in Chicago 515 were found to be diseased.

SOME EARLY STATEMENTS SHOWING NECESSITY FOR INSPECTION.

In 1870 United States Commissioner of Agriculture Horace Capron saw the danger that menaced the public from eating unwholesome meats, for he said, in urging the establishment of a division of veterinary surgery in the Department of Agriculture, "The value of stock lost annually from disease is enormous and threatens not only to decimate our animals but to expose the human family to disease from the consumption of unwholesome meats." Some years later Commissioner William G. Le Duc, in commenting on the prevalence of hog cholera or swine plague, said that while it had not been shown that the disease could be communicated to man, at least in a fatal type, no diseased animal was fit for food. It was a notorious fact, he said, that many entire herds of swine were slaughtered as soon as the disease was discovered to have made its appearance among them and that their meat was placed on the market for sale and ultimate consumption.

EARLY MUNICIPAL INSPECTION AT CHICAGO.

According to a report by Mr. Edward W. Perry, special agent of the Bureau of Animal Industry, published in the First Annual Report of the Bureau (1884), a number of articles appeared in the Chicago newspapers in September, 1882, declaring that numbers of diseased animals were taken from the stock yards and slaughtered for food for human beings. The articles were very graphic in their description of scenes in the slaughterhouses and stock yards and were copied widely in the Eastern States, as well as in Europe. Although it was explicitly stated that great care was used by canners and by shippers of dressed beef to prevent the slaughter for their use of animals unfit for food, the effect of those articles was damaging to the interests mentioned. The principal packers and shippers of beef at once exerted themselves to assist the city health authorities of Chicago in their efforts to prevent the sale of any animal suffering from disease or from injuries that made the flesh unfit to eat. The department of health had authority for this purpose over the entire area within a line 1 mile outside of the limits of the city. An inspector was stationed at each slaughterhouse, and one was constantly on duty at the stock yards during the hours when the gates of the yards were open for the passage of stock. The officers scrutinized the animals offered for sale, especially those destined to be slaughtered in Chicago. If an animal exhibited indications of a disease making the flesh unsuitable for food, it was ordered sent directly to an establishment where the carcass might be converted into fertilizer. Employees of the canning companies and of shippers of dressed beef

reported to their principals or the inspectors the presence in the markets of any diseased animal, and condemnation quickly followed.

Inspectors also were stationed at the wholesale markets to examine the meats offered for sale. When the meat was condemned, kerosene was poured over it.

In 1881 Chicago had five meat inspectors on duty, according to Dr. Oscar C. Dewolf, commissioner of health of the city. Two of these inspectors were detailed for duty at the stock yards and three in the city markets. Technically the city had no right to exercise police power at the stock yards, but the stock-yard proprietors and commission men dealing in animals found it to their interest to permit the city inspectors to exercise their functions at the yards, because if an animal was condemned as unfit for food the carcass was retained for fertilizing purposes, while if it were sent to the markets outside the yards it would have been confiscated when condemned and no return made to the owner.

Mr. Perry, after investigating conditions at Chicago, wrote as follows: "These facts seem to warrant the assertion that the meat supply of Chicago is practically entirely wholesome. Self-interest leads the packers and canners to use every available means for preventing even the shadow of suspicion resting upon the goods they have to sell; hence they become most efficient aids to the health department, which has given proof of efficiency in this branch of its work." Mr. Perry further said that comparatively very few of the cattle received at Chicago showed evidences of disease.

Doctor Dewolf stated that the city health authorities were only interested in protecting the citizens of Chicago, but that for scientific purposes and for other reasons he had closely observed the condition of the hogs received at the stock yards since February, 1877; and he declared that he knew positively that the stories and reports current as to the disposition of packers to slaughter diseased or emaciated hogs for packing purposes were maliciously and wickedly false.

INSPECTION AT CINCINNATI.

In Cincinnati skilled inspectors were appointed by a board of officers of the chamber of commerce. They were placed under bonds for faithful performance of duty, governed by specific regulations, and accountable to the committee on provision inspection, also appointed by the board of officers of the chamber. These inspectors were ready at all times to inspect hog products, and buyers were urged to have their products inspected. Inspectors also were appointed by the municipality charged with supervising all stock.

FOREIGN RESTRICTIONS ON AMERICAN LIVE STOCK AND MEATS.

It is clear that inspection by city health authorities and by the packers themselves obtained in the Union Stock Yards in Chicago and in the slaughterhouses of other cities for a number of years prior to 1881, and it is probable that a more or less efficient inspection was practiced from the beginning of the meat-packing business. That this inspection was not satisfactory to some foreign governments, however, was shortly to be shown by the action of several nations in placing restrictions upon our exported meats, and finally in prohibiting them entirely. The decrees against American meats were considered unjust, for the general physical condition of the animals in this country was better than in other countries, and it was generally accepted by stock raisers and meat packers that the prohibition was for the purpose of preventing competition.

Restrictions began with pork products, Italy being the first country to issue a decree, in 1879. She was followed by Hungary a few months later, Spain and Germany in 1880, France, Turkey, and Roumania in 1881, Greece in 1883, and Denmark in 1888. The reason assigned by these countries for prohibiting the entry of our pork was the alleged presence therein of trichinæ and the impracticability of a sufficiently thorough microscopic examination to guarantee that the meat was not affected. Following the passage by the United States Congress of the law of 1891 and the commencement of microscopic inspection of pork, Germany, Denmark, Italy, France, Austria-Hungary, and Spain modified their regulations so as to admit swine products if they were certified to as free from trichinæ.

In the latter part of 1894 various States in Germany and the countries of Denmark, Belgium, and France prohibited the importation of cattle from the United States, giving as a reason the prevalence of Texas fever, pleuro-pneumonia, etc. Since 1879 Great Britain has required that American cattle shall be slaughtered immediately upon arrival. This restriction was brought about by the existence of pleuro-pneumonia in the United States. In 1880 Commissioner Le Duc sent a veterinarian to England to inspect cattle upon their arrival there, and during his stay there not one of the living animals out of 11,000 exported was found to be affected with the disease, and upon post-mortem examination of the lungs only six cases were detected.

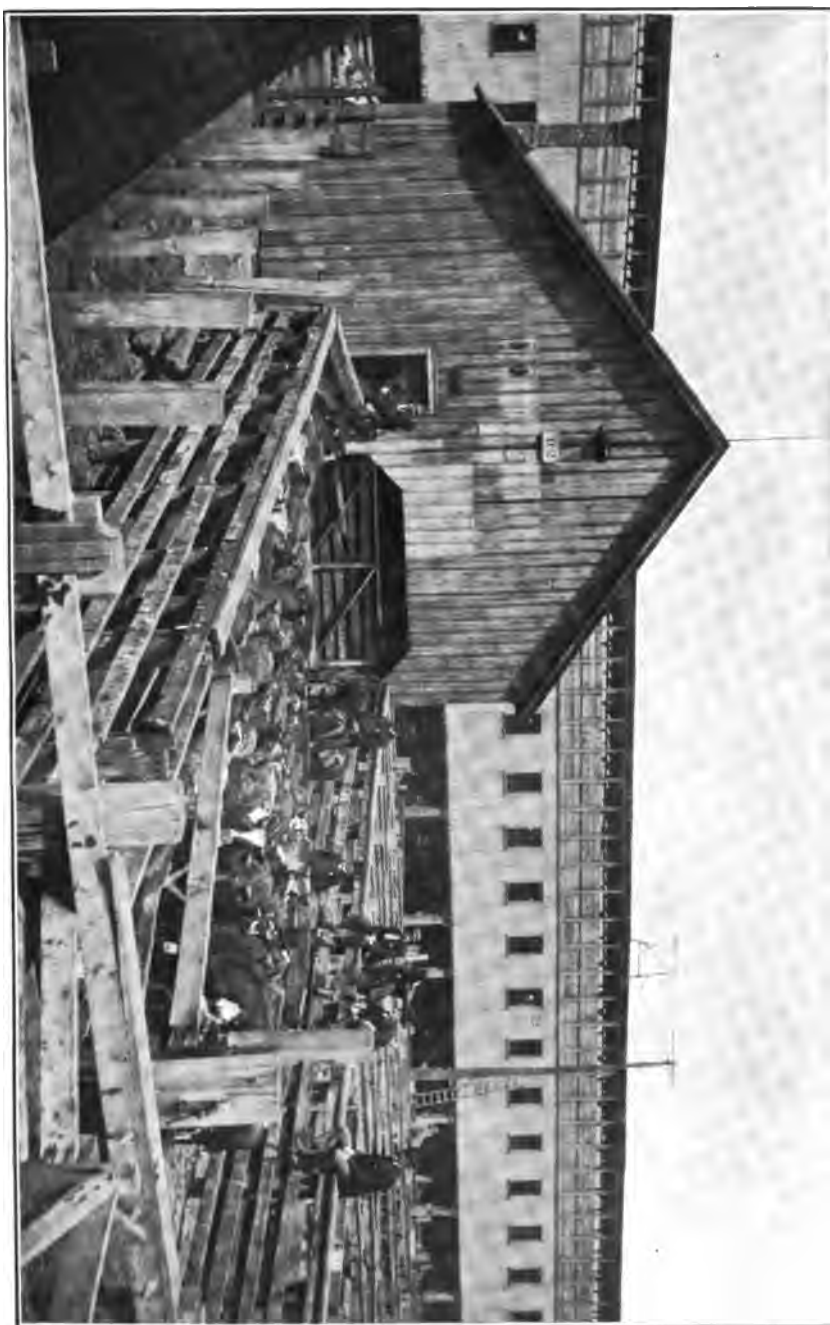
Following the prohibition of our pork by Germany and other countries, the Department of State in March, 1881, prosecuted an examination into the various phases of the pork industry in the Western States, covering all possible causes which could operate to render the products dangerous to health, and in October, 1883, the President appointed a commission of impartial scientists and representatives of the New York Chamber of Commerce and the Chicago Board or

Trade, instructing the members thereof "to make a searching examination on the spot of all the conditions of the hog-raising and pork-packing industries of the United States, and to follow by the most practical examination the course of this food staple from the fields and farms of the United States to the wharf where it is shipped or to the shop where it is exposed for sale and domestic consumption." The results of these investigations were communicated to Congress by the Executive, accompanied by voluminous diplomatic correspondence and other information bearing on the subject. While it was conceded that trichinosis was found in American swine, the proportion of animals thus affected was declared to be less than in the countries of Europe.

RECOMMENDATIONS FOR ESTABLISHMENT OF FEDERAL INSPECTION.

In 1885 Commissioner Norman J. Colman called the attention of Congress to the importance of vigorous means and measures to protect our cattle interests, saying that the existence of pleuro-pneumonia and other contagious diseases had a very serious effect upon our foreign and interstate commerce in living animals. The Commissioner pointed out that Great Britain on account of it had placed such restrictions upon the trade that no cattle, sheep, or swine could be sent there from this country except for immediate slaughter at the landing place. He showed that since the restrictions were enforced the exportation of sheep had steadily declined from 108,652 in 1879 to 32,510 in 1884, and that of swine from 25,033 in 1879 to 4 in 1884. The restrictions upon interstate commerce from the same cause, the Commissioner said, also had been a great burden, and the reduction in the value of cattle in the affected States had been enormous. The traffic in live animals, he said, formed such an important part of the commerce of the country that such regulations should be adopted as would insure the removal of these restrictions and do away with the cause which led to them. Experience had shown that the powers conferred by the act creating the Bureau of Animal Industry were not sufficient for the purpose. Although relating primarily to the live-animal industry, the remarks of Commissioner Colman had a direct bearing upon the meat business.

In 1889 Secretary J. M. Rusk in his annual report made an earnest appeal for legislation which would provide for a Federal meat-inspection law. The Secretary in vigorous language called the attention of Congress to the widely prevalent rumors of cattle diseases in the United States, which, although having little foundation in fact, continued to be circulated extensively in foreign countries, to the great injury of our cattle trade. The existence of a demand for our surplus meat products, the Secretary said, was plainly evident, and it was in the highest degree desirable that the Government should



ANTE-MORTEM INSPECTION OF CATTLE.

ANTE-MORTEM INSPECTION OF SHEEP.



INSPECTION OF BEEF CARCASSES AT TIME OF SLAUGHTER.



adopt all means in its power to secure for producers every opportunity to compete on fair terms in the markets of the world for the disposal of their surplus production. "I would therefore insist most strongly," said the Secretary, "upon the necessity of such a national inspection of cattle at the time of slaughter as would not only secure the condemnation of carcasses unfit for food, if there be any, and guarantee the inspected product as untainted by diseases, but which should enable the national authorities to promptly discover any cattle disease centers."

The Secretary repudiated what he described as "captious objections" on the part of foreign authorities to the wholesomeness of our meat products, but added that as long as the Government neglected to take precautions universally adopted by the governments of those countries in which a market was sought for surplus products, and left it to the officials of other countries to inspect our live cattle or our meats, it was impossible to present as forcible arguments as could otherwise be made against restrictions on our trade, the foreign countries claiming, with some show of reason, that they had better opportunities for learning of diseases among American cattle than were enjoyed by the American Government itself.

"I therefore earnestly recommend," wrote the Secretary, "such an amendment to the law under which the Bureau is at present organized as will provide for such official national inspection as shall guarantee the fitness of our meat products for food consumption under the seal of the United States Government."

THE FIRST FEDERAL MEAT-INSPECTION LAW.

The following year (in August, 1890) Congress took the first step toward the establishment of Federal meat inspection by the passage of a law "providing for an inspection of meats for exportation." This act provided for a careful inspection of salted pork and bacon intended for exportation, to determine whether it was wholesome and fit for food, when the laws, regulations, or orders of any foreign government required inspection, or when any buyer, seller, or exporter of such meats requested inspection; and also for the inspection of all cattle and sheep for export. Such inspection, it was provided, should be made at the place where the meats were packed or boxed, and the meats should be stamped or marked after inspection. The inspectors were authorized to issue certificates of inspection to the shipper of the meat and to the consignee and also for the Department of Agriculture.

Primarily, therefore, meat inspection by the Federal Government was begun in the United States not because Congress had in view the

protection of the people of this country from the results of eating diseased meats, but because foreign governments were opposed to allowing American meats to enter their ports for the alleged fear that the people of those countries would suffer therefrom.

Under the law of August 30, 1890, the Bureau prescribed regulations which required all packers or exporters, buyers, or sellers of such meats to make application in writing to the Secretary of Agriculture for inspection. Every inspected package of salted pork or bacon was required to be stamped, if found wholesome and fit for human food. Certificates of inspection were issued to the exporter, the consignee, and the Department. Inspectors were required to report daily the number of stamps issued.

While this law was a step in the right direction, it soon became apparent that it did not meet all conditions. It was the intention of Congress in passing this measure to enact a law which would enable the Government so to certify to the wholesomeness of our pork products as to entitle them to entry in foreign countries. The act, however, provided more particularly for an inspection which would determine the character and manner in which these products were packed and their condition at time of shipment, and did not reach to the more important end of determining whether or not the animals from which they came were diseased at the time of slaughter. The consequence was that foreign governments refused to recognize such inspection certificates as were issued thereunder as sufficient to warrant the removal of the prohibition which they had maintained. Secretary Rusk called the attention of Congress to this inadequacy of the law, and suggested the more important provisions which should be made.

The interest of the people in meat inspection had been increasing steadily, and with the concentration of the slaughtering business in a few large cities the feeling became strong that there should be a more rigid supervision for the protection of the health of consumers than that afforded under the law of 1890 or by the local authorities where the abattoirs were located. This feeling found expression in various States by the enactment of laws designed to secure inspection of meat introduced from beyond their borders. On the ground, however, that such laws were to a greater or less extent discriminative, they were in most if not in all cases held to be unconstitutional, and the desired object was not accomplished.

In addition to the desire of consumers to be protected from the real or fancied dangers to their health there were to be considered the fears excited abroad by alarming though unfounded statements of sensationalists interested in injuring our export trade. It became apparent that if the country was to keep its foreign markets not only must the best meats of all kinds be sent abroad, but they must be

accompanied by certificates that they had been properly inspected and that the animals from which they came were perfectly sound and free from any disease.

THE LAW OF 1891.

In the light of these conditions Congress passed the act of March 3, 1891, which provided for the inspection of live cattle, hogs, and the carcasses and products thereof which were the objects of interstate commerce, thereby giving authority for an inspection of animals and meats.

This law provided, among other things, that the Secretary of Agriculture should cause an inspection to be made, prior to the slaughter, of all cattle, sheep, and hogs which were the subject of interstate commerce and which were about to be slaughtered at slaughterhouses, canning, salting, packing, or rendering establishments in any State or Territory, the carcasses or products of which were to be transported and sold for human consumption in any other State or Territory. In addition to this ante-mortem inspection it was provided that "there *may* be in all cases where the Secretary of Agriculture may deem necessary or expedient a post-mortem examination of the carcasses of all cattle, sheep, and hogs about to be prepared for human consumption at any slaughterhouse, canning, salting, packing, or rendering establishment in any State or Territory, or the District of Columbia, which are the subjects of interstate commerce."

It was also provided in this law that it should be unlawful for any person to transport from one State or Territory to another State or Territory, or for any person to deliver to another for transportation from one State or Territory to another, the carcasses of any cattle, sheep, or swine, or the food products thereof, which had been examined in accordance with the law and found by the inspector to be unsound or diseased. It was declared that any violation of this law should be punishable by a fine not exceeding \$1,000, or imprisonment not exceeding one year, or both. Cattle, sheep, or swine slaughtered by any farmer upon his farm and transported from one State or Territory to another were exempted from the operations of this law except in case the carcasses of such cattle, sheep, or swine went to any packing house or canning establishment and were intended for transportation to another State or Territory, in which case they were subject to a post-mortem examination.

REGULATIONS UNDER THIS LAW.

The regulations issued under this act provided for an examination before and after slaughter by veterinary surgeons of all animals slaughtered for export or interstate trade, the condemnation of all

animals found to be diseased, and the proper identification of the carcasses and other products entering into these two classes of commerce.

The regulations prescribed that a veterinary inspector should be assigned to each establishment applying for inspection that had been officially numbered, and that the inspector should have full and free access at all times to all parts of the building or buildings used in the slaughter of live animals and the conversion of their carcasses into food products. The inspector was required to inspect carefully all animals in the pens about to be slaughtered, and no animal was allowed to pass to the slaughtering room until it had been inspected. Whenever an animal was found to be diseased it was condemned and the owner directed to remove it from the premises and dispose of it in such manner as was provided by the laws of the State and municipality in which the abattoir was located. The inspector was also required to make an examination of all animals slaughtered and make a report of the post-mortem inspection to the Department. Carcasses found to be diseased and unfit for human food were ordered to be at once removed under the supervision of the inspector and to be disposed of in the manner prescribed by the State laws. Any owner of an establishment who allowed any animal found diseased to remain on his premises beyond the time set by the inspector for removal forfeited his right to inspection and was refused certificates of inspection upon his products. Records were kept of the time and place of inspection, the number of the establishment, and the name of the packer and inspector, in order that all inspected packages might be traced to the place of origin.

The regulations also provided for a microscopic examination of hogs after slaughter in order to certify that they were free from trichinæ, Germany and other countries having prohibited such meats on the ground that they were so affected. When the slaughtered hog was passed into the cooling room the veterinary inspector or his assistant took from each hog carcass three samples of muscle, one from the pillar of the diaphragm, one from the tenderloin, and the other from the shoulder. These samples were put into a tin box and a numbered tag placed upon the hog and a duplicate number on the box containing samples. The samples were then taken to the microscopist, who made a thorough examination of each sample, furnishing a written report to the inspector in charge of the killing room. All hogs reported as affected with trichinæ were at once removed from the cooling room under the supervision of an inspector, and disposed of by tanking or by thoroughly cooking.



RETAINING ROOM.

[In this room carcasses held on suspicion on first inspection are retained in custody of inspectors for more thorough examination and final decision.]



CONDEMNED-MEAT ROOM.

[In this room condemned meat is kept locked until disposed of according to the regulations.]

OPERATIONS UNDER AND EFFECTS OF THE LAW.

The first inspection under these regulations was in New York City at the abattoir of Eastman & Co., May 12, 1891, and was confined to the inspection of their export dressed beef. At the beginning of June, 1891, the work was inaugurated in Chicago, and soon thereafter at South Omaha, Nebr., Kansas City, Mo., Milwaukee, Wis., Jersey City, N. J., and Hammond, Ind. The microscopic examination of hogs was commenced at the abattoirs of Nelson Morris & Co., Armour & Co., and Swift & Co., Chicago, on June 22, 1891.

The workings of this inspection and the carrying out of the regulations were watched with careful scrutiny by the representatives in this country of foreign governments, and the first result of the microscopic examination of hogs was an order made by the German Government on September 3, 1891, removing the prohibition that it had maintained since 1880 against the importation of American pork products. The removal of this prohibition by Germany was followed within a short time by the removal of a similar prohibition by Denmark, and later by Italy, France, and Austria.

The demand for inspection by the packing houses became at once very large, and the insufficiency of the appropriation for the work was made apparent. The attention of Congress was called to this in the first report made by the Secretary of Agriculture after the work was instituted, and it was recommended that Congress appropriate money enough to extend inspection to all applicants.

In the first full year following the institution of Federal meat inspection (the fiscal year ending June 30, 1892) 5,076,929 animals were inspected, of which 3,167,150 were cattle, 59,089 were calves, 1,267,329 were hogs, and 583,361 were sheep.

The experience of the Bureau in making microscopic examinations of pork under the system first established proved in the first year that one examination of three specimens taken from a carcass was not sufficient. The system was, therefore, changed on September 7, 1892, when an order was issued requiring a double examination to be made. Out of 1,172,047 carcasses examined after that order went into effect there were found on the first examination 34,552 containing trichinæ, while on the second examination there were found 5,518 others affected in the same way.

The cost of the inspection of cattle, sheep, and calves to the Government for the year mentioned was $5\frac{1}{2}$ cents per carcass, and for the microscopic examination of pork 6 cents per carcass. The following year the cost of cattle and sheep inspection was reduced to $4\frac{1}{2}$ cents per carcass, while the cost of the microscopic inspection of pork was increased by the double examination to $8\frac{3}{4}$ cents per carcass. The total cost of meat inspection for the first full year was \$279,508.37.

Following the raising of the prohibition in Germany against American pork, the exports from this country increased largely, and in 1892 there were exported 38,152,874 pounds of inspected pork. The next year, however, the exports decreased to 20,677,410 pounds. The quantities exported directly to countries requiring inspection in 1892 were 22,025,699 pounds, and in 1893, 8,059,758 pounds. In a measure this decrease in the exports was attributed to the high price of pork in this country. Other causes were the obstacles put in the way of importation by certain import regulations instituted by the foreign countries which largely imported our meats. Foreign newspapers printed statements criticising the work of inspection and disparaging the quality of our meats. It was said that there were but two or three inspectors at a great packing center like Chicago or Kansas City, and that the hogs were cut into pieces at the time of slaughter, so that it was impossible to identify them after the specimens had been examined microscopically. The German Government, instead of opposing the admission of American pork for want of inspection, after the microscopic inspection had been established in this country, claimed that the American certificates of inspection were not correct. France also imposed burdensome regulations on American pork even after it had been microscopically inspected. Belgium followed with a practical prohibition of American dressed beef in the requirement that the lungs of the animals accompany shipments.

The benefits arising from meat inspection as carried on under the law of 1891, however, made it apparent that the inspection could be extended with profit. Secretary Rusk in his last annual report pointed out the need for extending the inspection to cover all animals slaughtered for human food, in order, first, to secure to the American consumers, who are large meat eaters, and who ought to have the very best kinds of food, the most healthful meats, free from all possible taint or disease. It was also important, the Secretary said, that the reputation of American meat products should be maintained abroad.

By the year 1894 meat inspection had grown into the most important and extensive part of the work of the Bureau of Animal Industry. The ante-mortem and post-mortem examination was extended to hogs at the various abattoirs where inspection had been established, thus greatly increasing the field of this service. In that year inspection was carried on at 46 abattoirs in 17 cities, whereas in the first year of meat inspection but 22 abattoirs had inspection.

RECOMMENDATIONS FOR STRENGTHENING THE LAW.

The Chief of the Bureau of Animal Industry (Dr. D. E. Salmon) in his report for 1895 suggested that the States could provide an

efficient method of cooperation by enacting legislation making it illegal to sell for human consumption within the State any meat from animals condemned by Federal inspectors unless the animals were held a sufficient time before slaughter to enable them to recover and become fit for food products. This, it was pointed out, would obviate the necessity for applying the State meat-inspection service to the abattoirs which had Federal inspection. The meat-inspection service, he said, would not be in a satisfactory condition until such cooperation was effected.

Despite the absence of a law giving it authority, the Department prevented the sale, even for local trade, of the condemned carcasses of animals slaughtered in abattoirs where inspection existed, by threatening to use its power to expose any firms which dealt in that class of meat.

It was urged that Congress should give the Bureau more power to administer the meat-inspection service. Condemned meat, it was said, need not be destroyed, but the owners should be compelled to use it in a legitimate manner, as in the manufacture of fertilizers and grease. It was not proper for human food and should not be sold for that purpose. It was suggested that to saturate such meat with a nauseous compound like carbolic acid, which would enable anyone to detect it at once, would not detract from its intrinsic value, but would prevent its fraudulent use; or it could be immediately rendered into fertilizer. In addition to giving authority to the Bureau to require a proper disposition of the condemned meat, it was urged that there should be a penalty for failure to dispose of it according to the Department regulations.

It was also recommended that an addition be made to the law prohibiting the operation of an abattoir in the absence of an inspector, and that abattoirs should not be opened on Sunday. The managers of some abattoirs at that time and afterwards showed a disposition to kill animals at night or very early in the morning or on Sunday without notifying the inspector.

THE AMENDMENT OF 1895.

The act of Congress of March 2, 1895, providing for the expenses of the Department of Agriculture, amended the act of March 3, 1891, so as to confer power upon the Secretary of Agriculture to make such rules and regulations as he deemed necessary to prevent the transportation from one State or Territory to another, or to any foreign country, of the condemned carcasses or parts of carcasses of cattle, sheep, or swine which had been inspected in accordance with the provisions of the law.

There was no further enlargement of the Department's powers until 1906, although the officials constantly recognized their limitations

and attempted by three recommendations that appear in reports, as well as through quiet work of which no record is preserved, to secure legislative enactments that would remedy the defects.

INEFFECTUAL EFFORT TO PLACE COST ON PACKERS.

In 1897 the Committee on Agriculture presented to the House of Representatives a bill proposing that the Secretary of Agriculture should charge for the inspection of meat at the rate of 3 cents a carcass for cattle, 1 cent a carcass for sheep and swine and other animals, 3 cents for each carcass or piece of pork examined microscopically, and 1 cent a hundred pounds for meat reinspected. The committee said that the expenses of the Bureau of Animal Industry had increased and that the beneficiaries should pay at least a portion of this expense, and they added that the packers who had inspection were the beneficiaries, for "they certainly enjoy market advantages not possessed by the owners of meats not so inspected and certified." The average cost of meat inspection was then 5 cents for cattle, 2 cents for calves, sheep, and swine, and 5 cents for microscopic examination of each piece of pork, and the committee proposed to divide this between the public and the packers. The bill failed.

THE LAW OF 1906.

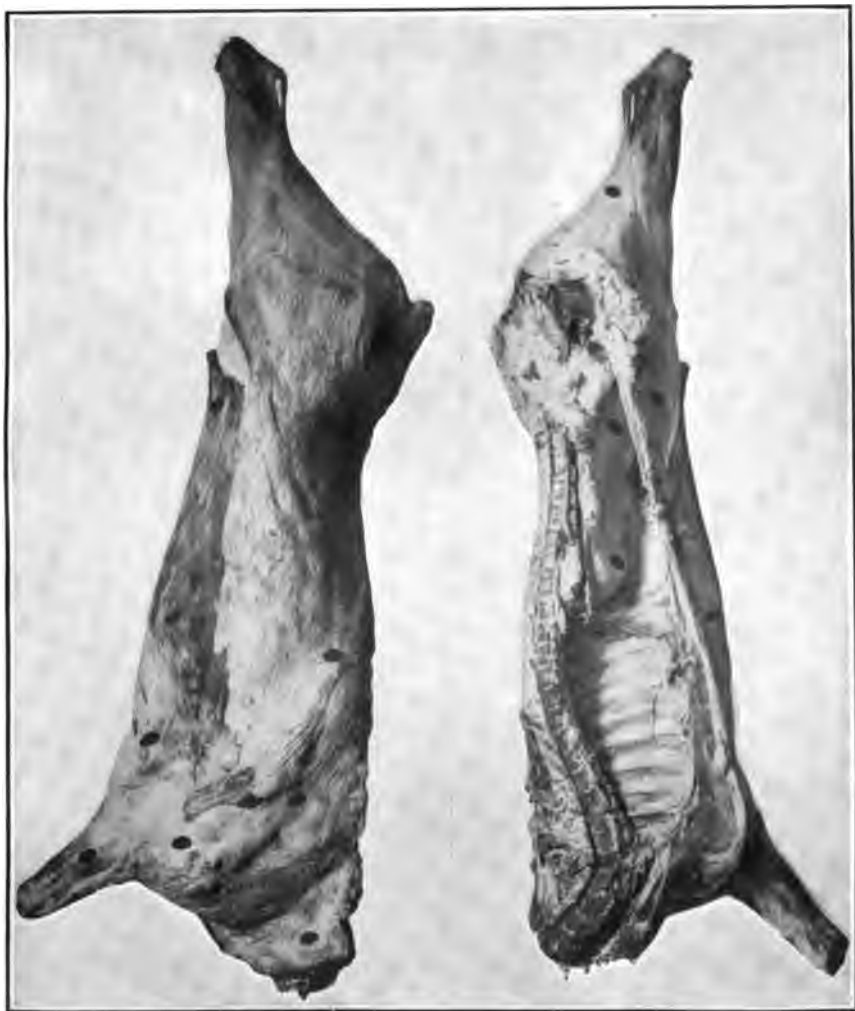
Although neither the law of 1891 nor the amendment of 1895 mentioned sanitation, the Department in February, 1906, issued a radical rule, demanding cleanliness in all parts of the packing house and the installation of toilet rooms. Progress was being made on this line when the agitation of 1906 directed public attention to the inadequacy of laws on the subject and brought about the enactment of the law of June 30, 1906. The so-called revelations, however, can scarcely be said to have added anything to the Department's knowledge, while such of the strictures as were exaggerated and incorrect were, from the Department's thorough familiarity with the subject, easily refuted.* The defects and limitations of the laws under which the inspection had been conducted up to that time were realized by the Department, and several unsuccessful efforts had been made by the Secretary of Agriculture and the Chief of the Bureau to procure the enactment of new legislation and the increase of appropriations in order to extend the inspection and improve its efficiency. The disclosures of unsatisfactory conditions in 1906 related almost wholly to canned and prepared meats, the use of preservatives, and the insanitary condition and methods of the packing establishments—matters over which the Department up to that time had no control under the law.

* See Supplemental report of the Department committee, commenting on certain publications reflecting on the meat inspection, page 443.



MARKING INSPECTED AND PASSED CARCASSES.

[The marking is done by means of a metal hand stamp and specially prepared ink. The design of the stamp is shown in fig. 1 (page 84).]



SIDES OF BEEF, SHOWING LOCATION OF INSPECTION MARKS.



INSPECTED AND PASSED BEEF IN COOLER.

The law of June 30, 1906, took effect the next day, except that the provisions regarding the transportation of meats did not go into effect until October 1. It conferred on the Secretary of Agriculture greater power and made a permanent annual appropriation of \$3,000,000 to pay the cost of the inspection, enabling the Department to greatly extend and strengthen the inspection service. Under this law the inspection is applied not only to the live animals before slaughter and to the carcasses immediately after slaughter, as was the case under the former law, but afterwards to the meats and meat-food products in all the stages and processes of preparation, curing, canning, etc., and the Department is empowered to require sanitary equipment, conditions, and methods in the slaughtering and packing establishments, to prevent the use of harmful chemicals and preservatives and of misleading labels, and to regulate the transportation of meat in interstate and foreign commerce.

This law applies only to cattle, sheep, swine, and goats, and to the carcasses and meat food products of these animals. Poultry, fish, and game are not subject to inspection, and there is no need at present to provide for the inspection of either horses or dogs, there being none slaughtered for food in this country.

The largest sum ever expended for meat inspection in any one year before the passage of the new law was a little more than \$800,000.

DESCRIPTION OF THE MEAT INSPECTION.

Meat inspection under this law proceeds by logical steps. Meats or meat food products, except those of farmers, retail butchers, and retail dealers, can not be shipped from one State to another or abroad unless they bear the official meat-inspection marks. A person or firm desiring to make such shipments must therefore make application to the Department for inspection, stating the extent and character of the business expected to be done. The Department, as directed by the law, sends its experts in sanitation, who look over the plant and make their report with recommendations to the Washington office.

SANITARY REQUIREMENTS.

Usually changes are required in sanitation or in facilities for conducting the inspection. The Department points out to the applicant the necessary changes, and its requirements are in accordance with broad and well-known principles. It requires that each room used in the ordinary processes be well lighted and ventilated; that ceilings, walls, and floors be of such materials as to be easily cleaned; that toilet rooms, urinals, and dressing rooms sufficient in number and ample in size be provided and be fitted with modern lavatory accommodations, including running water, toilet paper, soap, and towels; such rooms must be properly ventilated and lighted and be

entirely separate from the compartments where carcasses are dressed or meats handled. The last-mentioned compartments must be so located that odors may not drift into them from toilet rooms, catch basins, tank rooms, hide cellars, etc. The premises about the plant and belonging to it also come in for attention. The yards, pens, alleys, and chutes must be clean, and the common practice of fattening hogs or other animals on the refuse of the slaughterhouses is forbidden on the premises, as well as any other use not countenanced by the principles of sanitation. When reports show that the packer has put his plant in proper condition, the Bureau assigns an official number to the establishment, details a sufficient number of inspectors to conduct the inspection, and business may proceed.

This, however, is not all there is to the sanitation required by the law. A slaughterhouse gets dirty with great rapidity; like a small boy, it requires constant cleaning. Blood flows in streams, and entrails with their contents must be handled. One day's operation, or less, is sufficient to put the plant into such a condition as to offend the sensitive eye and nostril and to sicken the weak and unaccustomed stomach. For his own profit the enterprising packer will keep up a degree of cleanliness, but the Bureau requires more. It demands that ceilings and walls shall be frequently cleaned and whitewashed or painted, and that trucks, trays, and other receptacles, chutes, platforms, racks, tables, and all tools used in moving, handling, cutting, chopping, mixing, canning, or other processes be thoroughly cleaned each day they are used. It looks after the workers also and forbids the employment of anyone who has tuberculosis or other communicable disease; it requires that the clothing which comes in contact with the meat shall be of a material that is readily cleaned, and that it shall be cleaned each day. This requirement has induced many of the larger packers to establish laundries and provide their workmen with clean outer clothing daily. Personal cleanliness on the part of the workmen is insisted upon, and to such an extent is this carried that some establishments employ professional manicures who daily treat the hands of girls engaged in handling such products as chipped beef.

At present the Department encounters little trouble in securing compliance with its requirements at new plants; but, as may well be understood, the first appearance of the new regulations created some consternation. The Department did not desire to stop arbitrarily the meat business of the country, but there was much to be done and little time to do it. By maintaining a firm and rational attitude, however, the Bureau has succeeded in permitting business to proceed in accordance with the law and in bringing about a standard of cleanliness that never before prevailed among the slaughtering and meat-packing establishments of the country.

ANTE-MORTEM INSPECTION.

As conducted at present, the first step in actual inspection is the examination of the living animal. (See Plates I and II.) The law does not absolutely require this, but places it within the discretion of the Secretary. Government inspectors make this examination in the stock yards or in the pens, alleys, etc., of the establishment by which the animals have been bought and in the slaughterhouse of which they are proposed to be slaughtered, and no animals which have not undergone this examination are allowed to enter the slaughterhouse proper. The pens contain from as low as 10 to as high as 200 animals each. The inspector goes into the pen and looks carefully over each animal. When he finds one that to his mind is not perfectly sound and healthy he or his assistant affixes to its ear a numbered metal tag bearing the words "U. S. Suspect." Such animals are segregated and slaughtered separately from other animals, either before or after the regular course of the killing. If the post-mortem examination of an animal does not confirm the suspicions aroused by the appearance of the live animal, and no lesions of disease are found, the tag is taken off and sent to the office of the inspector in charge of the station, who has already been informed of the number of the tag after it was affixed on suspicion, and the carcass is sent along as edible meat. If lesions are found which warrant condemnation, the carcass is sent to the tank, the tag being removed and taken with a report to the office.

During the nine months ending June 30, 1907 (the time covered by the new law), the Bureau inspected ante-mortem nearly 51,000,000 animals and held out as suspicious 42,439, of them. Of these suspects 9,262 on subsequent post-mortem examination were entirely condemned.

THE PROCESS OF SLAUGHTERING.^a

Animals which have been found by the inspector on the ante-mortem inspection to be sound and healthy are not marked, but proceed by runways into the slaughterhouse itself and to the killing floor, which for cattle is usually at the top of the building. The cattle go into narrow inclosures, called "knocking pens," from one to five to a pen. The knocker walks on a platform above and with a poleax strikes the animal on the head. As it falls stunned the side of the pen opens, the pen floor tilts, and the animal rolls out on the "beds" a foot or so below. In a few moments a shackle is attached to a hind leg and the animal is hoisted and hangs from the rail of an overhead tramway. In this position the sticker bleeds him by a longitudinal incision that

^a This description applies especially to the typical large establishment with modern equipment. While methods and details may vary in the smaller houses, the inspection is carried out on substantially the same principles.

severs the principal blood vessels in the neck. When the blood is to be used for food purposes it is caught in a numbered receptacle and held until the carcass is further examined. The overhead traveler now carries the animal forward, and workmen skin the head and cut it off, placing it on a rack and marking it so that it can be identified should cause for condemnation be found elsewhere in the carcass.

A string of butchers now follow each other in rapid succession. The "leggers" remove the hind legs at the hock and the forelegs at the knee; the "sider" skins the animal down as far as he can work toward the floor; the "caul puller" cuts the carcass from throat to anus, removing the caul fat from the abdomen and placing it in a box, which is numbered for identification; another butcher loosens the trachea and saws through the sternum; another butcher skins the buttocks and usually cuts off the tail, which latter is also marked for future identification. The carcass is now hoisted clear of the floor and the "backer" finishes the skinning; at the same time the "gutter" is at work removing the viscera; the rump sawyer then takes the eviscerated carcass and divides it from the coccyx to the lumbar vertebræ; the "splitter" follows with his cleaver and continues the splitting to the base of the neck; the neck man or hide dropper finishes cutting the hide from the neck, after which another butcher splits the cervical vertebræ, thus separating the halves. Trimmers then cut off the ragged pieces of flesh, remove the spinal cord, and pump the blood out of the forequarters by rapidly moving the forelegs up and down.

These various processes are mentioned in detail to show the high degree of specialization attained in the work of slaughtering in the large American establishments as compared with the slower process of this work in foreign countries.

POST-MORTEM INSPECTION.

At the first exposure of the glands when the head is severed—these being common seats of tubercular infection—a Federal inspector makes an examination for evidences of disease, himself cutting into the glands, if necessary. Another inspector stands at the elbow of the gutter and, as the viscera are revealed, watches with practiced eye for abnormalities, carefully examining and handling the various parts in order that any obscure indication of disease may be discovered. (See Pl. III.) The Bureau requires this inspector to handle the viscera and, if necessary, to cut into them. This is rapid as well as exacting work, and the head and visceral inspectors frequently exchange places, or the visceral inspector is relieved by another, after two hours' work.

When the inspector finds a diseased carcass he attaches to it by means of a wire and seal a paper tag with the words "U. S. Re-

tained " on it and numbered to correspond with the number on the stub from which it is taken. He sends the numbered stub to the office with his report. The carcass, with the parts that have been separated, none of which is allowed to lose its identity, is now sent directly to a compartment called the "retaining room." (See Pl. IV.) The Government requires this important room to be rat proof, well lighted, to have floors of cement, or of metal or brick laid in cement, and to be provided with facilities for locking. The Government also provides a special lock for the room, and the keys remain in the custody of the inspector. At convenient periods the retained carcasses undergo in this room at the hands of other inspectors a more leisurely and careful inspection.

This is the final step in the post-mortem examination. The inspectors here have a good deal of personal discretion. Certain definite rules are laid down by the Bureau, but something must be left to the judgment of the inspectors. They must pass upon the question of the extent of the affection and decide whether or not the whole carcass or only parts of it should go to the tank. Not being pushed by the exigencies of the rapid work on the killing beds and the necessity of keeping up with the never-ending stream of carcasses, they are deliberate and careful in making their examinations and in forming their judgment. Carcasses which they decide to be fit for food they permit to be removed and placed with other healthy carcasses, which have been passed on the first inspection. They take off the " U. S. Retained " tag, return it with their report to the office and stamp it " U. S. Inspected and Passed."

When their examination confirms the suspicious indications of the first examination, however, they stamp conspicuously on the carcass, also on the tag, the words " U. S. Inspected and Condemned." The carcass is removed immediately from the retaining room under the eye of a Government employee, and goes either to the tank or, if it is not convenient to tank it immediately, to the condemned meat room (Plate V), which, like the retaining room, is provided with a lock, the key of which is kept by a Government employee, and which is opened only by Government employees. As soon as practicable Government men remove the carcass to the tank, keeping a record of the tag numbers, which they forward with their reports to the office. At houses which do not provide a " condemned room " the carcass is sent directly to the tank. About 25 per cent of the carcasses retained are condemned.

All carcasses, both fit and unfit, having been removed from the retaining room, the floors and walls are washed with hot water and disinfected in order that the room may be clean and free from disease infection for the reception of the next batch of retained carcasses.

LABELING, ETC.

Returning now to the killing floor and to the carcasses with which the inspectors have found nothing unhealthy, the overhead traveler carries the separated halves along out of the way of the other operations, and workmen subject them to thorough washing with very hot water, usually from a hose or from an ingenious combination of hose pipe and brush, and wipe them dry with clean towels. During this process the hanging halves slowly approach the chill room, just before entering which they are marked with the inspection legend in five places or more on each side of beef, usually on the loin, rib, chuck, plate, and round. The marking is done by means of a metal or rubber stamp and a purple indelible ink, and the words thus stamped are "U. S. Inspected and Passed," or an abbreviation of these words, with the establishment number. (See Pls. VI and VII and fig. 1.) The number is one assigned to the house by the Department at the time inspection is begun. It is registered in the Department records, and

besides serving as a convenient means of reference it provides a sure method of tracing meat about which questions may subsequently arise.

This mark is absolutely necessary under the law to procure the movement of the meats between States. The law forbids carriers to transport from one State to another any meats that are not so marked, except the meats of farmers and of retail butchers and dealers. It may as well be

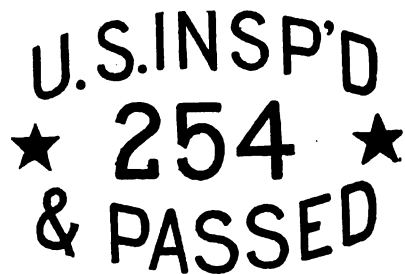


FIG. 1.—Facsimile of mark placed upon meat which has been inspected and passed. (The form of this stamp is subject to slight change, the essential feature being the words "Inspected and Passed" or an abbreviation thereof.)

repeated here, in order to emphasize the statement, that the Federal law does not and can not forbid the carriage of unmarked meats inside a State, so that in the absence of State laws the carriers may, unmolested, carry any kinds of meat from one part of a State to another.

The sides now pass to the chill room, where they are held at a temperature of about 36° F. for forty-eight hours or more before being further dealt with. (See Plate IX.) The head, tail, caul, and liver are removed to other parts of the house.

On modernly appointed killing floors the offal is expeditiously removed by means of chutes. The meat has not during the entire process of slaughter been allowed to touch the floor. When the inspector has detected disease in a carcass and attached the "Retained" tag to it, he orders the butchers, before they proceed to another carcass, to cleanse their hands of all grease and to immerse

them in a disinfectant solution, usually bichlorid of mercury, 1 to 1,000. He sees that all tools and implements used in the suspected carcass are likewise cleaned of grease and immersed in boiling water or in a disinfectant solution. For this purpose disinfecting tanks are now in general use, provided with three compartments—one of hot water to take off the grease, a second with the bichlorid of mercury solution, and a third with hot water for final rinsing.

The slaughter of calves, sheep, and goats follows generally the plan described for cattle, sheep often being killed at one end of the beef-killing floors.

SLAUGHTER AND POST-MORTEM INSPECTION OF HOGS.

The slaughter of hogs, however, is entirely separate and the processes are different. In the larger houses, where 300 to 500 hogs are killed in an hour, the slaughtering proceeds about as follows:

A group of hogs is herded in a pen, through one side of which revolves a huge hoisting wheel with stout hooks attached near the outer rim. Boys go into the pen and deftly attach the loop of a chain to a hind leg of the hog and hang the other end of the chain to a hook on the wheel. The wheel slowly elevates the squealing animal, and at the top the chain automatically passes to an inclined rail. The hog, hanging head down, passes to the sticker, who at one stroke severs the larger blood vessels of the neck. When the animal is dead the carcass is dropped into a great vat of scalding water, where it is poled from one end to the other. Long finger-shaped hooks then lift the body and pass it to an automatic scraping machine, which speedily removes most of the hair. Emerging from this, the carcass drops onto a moving platform, which carries it before a butcher, who almost severs the head, exposing the cervical glands, where about 93 per cent of the cases of tuberculosis are detected. Beside the butcher stands a Government inspector, who examines the glands, feels them, and, if necessary, cuts further with his own knife. (See Plate XI.) Quick and accurate work is demanded here. If he detects disease he marks the carcass—sometimes with a black cross on the fore quarter, sometimes by severing the ligaments of a foreleg. Beside him is a pail of disinfectant solution into which he thrusts his knife before the next hog reaches him. The animal thus marked passes on with the others, gambrel sticks are affixed, and the carcasses are hung on the overhead rail and subjected to washing and further scraping. Here the marked hogs leave their fellows. A Government employee switches them to another rail, attaches the "U. S. Retained" tag, and sends them along to the retaining room. Those carcasses the head examination of which has shown no disease pass on the regular rail to the gutters, who disembowel them. The carcass and viscera of each animal pass before another skilled inspector, whose duties are as unenviable as those of perhaps any other employee, for he

must sit close to his work and handle each set of viscera for evidence of disease. This found, he tags the carcass "Retained" and it is switched to the retaining room, the viscera likewise being tagged and sent with the carcass.

The carcasses which have thus far passed the head and visceral inspections and show no sign of disease proceed along the rail and are split into halves. Inspectors examine the freshly cut halves, and sometimes find lesions in the bones or muscles, in which case also the carcass is marked for the retaining room.

The processes from now to the finishing of the carcass are the same as those detailed for cattle. The untagged animals are allowed to pass through the shower bath, are labeled, and go to the cooling rooms. While inspectors make a closer examination in the retaining room of those carcasses which have been held as suspicious and determine whether they should be allowed to pass unconditionally, be made into lard, or be sent to the offal tank.

THE DOUBLE SYSTEM OF POST-MORTEM INSPECTION.

Briefly contrasting the two separate post-mortem examinations—that on the killing floors and that in the retaining room—we find that the floor inspectors have a very limited discretion. Their orders are to hold any carcass that shows the minutest lesions of disease. The business of both the head and visceral inspectors is to find disease and to stop the carcass then and there for a further inquiry. Once disease is found, or something that looks to the inspector like disease, the carcass must be retained.

On the other hand, the inspectors in the retaining room take their time. It is their duty to examine into the extent of the disease and, in the light of modern knowledge, to judge whether it is local or general, whether or not it unfits the meat for human food, and whether or not the fat may be allowed to be rendered into lard at a prescribed temperature. By this careful work the inspectors condemned in the fiscal year ending June 30, 1907, more than 50,000 carcasses of hogs out of about 175,000 held by the floor inspectors.

INSPECTION IS ADAPTED TO PACKING BUSINESS.

The Department provides a sufficient number of inspectors for this work and insists that they be furnished every facility in the way of space and light. Here, as elsewhere, it seeks to accommodate its inspection to the business of the owner of the abattoir. Within reason it will require its men to work as long as his, to begin as early, and continue as late. The inspectors will work as fast as the improving appliances of the establishment permit or as its needs demand, and the Bureau will not require the proprietor to stop his work to send for the inspector or to wait while the inspector returns to his



INSPECTION OF SHEEP CARCASSES.



HEAD INSPECTION OF HOG CARCASSES.

[This inspection consists of an examination of the glands of the neck for tuberculosis. Experience has shown that if the disease is present at all in the carcass it can be detected in these glands in 86 per cent of the cases.]

VISCERA INSPECTION OF HOG CARCASSES.



office and makes out an elaborate report—a procedure which is common in the inspection systems of some foreign countries. It requires only that notice be given of the hour that work is to begin, and its men will be on hand and ready to begin. In short, the Bureau of Animal Industry also specializes in its inspection service, and claims to be as modern and as up-to-date as the finely organized business it supervises.

MEANING OF "DISEASE."

Some explanation and caution in reference to the word "disease" as used in the foregoing description may be necessary. The percentage of animals condemned is not the only measure of the efficiency of a meat-inspection system. While it is true that a certain proportion of the animals inspected are practically sure to be diseased, and the system should discover, condemn, and destroy them, yet the inspection should be careful and discriminating. No country is so rich that it can afford to throw good meat into the tank. Prices of meat are usually high enough without increasing them by an indiscriminate condemnation of carcasses that are fit for food.

The word "diseased" in connection with meat inspection has a meaning that differs from the generally accepted idea. To the popular mind the thought of eating the meat of a diseased animal is abhorrent, yet it may be stated upon the most eminent medical authority* that "not any single animal used for food in any part of the world would, upon microscopic study, be shown to be absolutely free from all infection or lesion." From the standpoint of meat inspection, however, the meat of the great majority of animals is not considered "diseased." Some light infections are common to food animals, but there is no proof that they in the remotest degree depreciate the value of the meat or that the infection is transmissible to man. There may be a strictly localized tuberculosis, consisting, for instance, of an isolated tuberculous nodule in the lungs, in the liver, or in some other portion of the body. Such nodule would make the particular point infected "diseased," from the standpoint of meat inspection, but, the authorities referred to add, "the carcass in general would not be 'diseased,' and there would be no justification in condemning it." It follows, then, that at this point the inspector in judging whether a carcass is "diseased" or not must do so "upon the general principles of pathology in its relation to the public health, and not upon any preconceived, exaggerated, or sentimental idea."

* Commission of experts appointed by the Secretary of Agriculture to consider and advise concerning those portions of the Department's meat-inspection regulations relating to the disposition of carcasses affected with various diseases and abnormal conditions.

REINSPECTION OF MEATS AND SUPERVISION OF PROCESSES.

At this point—with the killing of the animal—previous meat-inspection laws practically stopped. The Department perforce formerly contented itself with placing labels on canned goods stating that the meat was from animals healthy at time of killing.

The present law is more inquisitive. It stations its agents at the doors of each of the other departments of the meat establishments, and they demand to be shown the marks indicating the previous satisfactory inspection of all meats that are brought in to be processed in any way. It is well known that many of the larger meat firms not only slaughter and sell carcasses whole, but also cut up carcasses and prepare them in numerous ways, as by curing, pickling, smoking, cooking, canning, or by making them into sausage, thus utilizing also many of the trimmings from the various parts of the carcass. Many other firms confine themselves to this latter feature of the meat business or to one or more branches of it, buying their meats from the slaughterers. In either case, if the products are to go into interstate or export trade, Government inspectors permit nothing to come in that has not been inspected and passed; furthermore, having satisfied themselves that the meats have been so passed, they make another careful examination to assure themselves that the meats have not spoiled or become unclean since the inspection at time of slaughter. Such as have undergone changes that make them unfit for food they reject, obliterate the inspection mark, and destroy. They then supervise the entire preparation, and require all fixtures and appliances, such as tables, trucks, trays, vats, machines, implements, cans, or containers of any kind, to be clean and kept clean. They see that no drugs, chemicals, or coloring matters are used, and no preservatives except salt, sugar, vinegar, wood smoke, and saltpeter.^a They make an exception in the preservative line, in accordance with the meat-inspection law, to the extent of allowing a manufacturer to pack export meats in accordance with the directions of the foreign purchaser when the use of such preservatives as he prescribes does not violate the laws of the country to which the meat is to be exported. For example, England makes no objection to the use of borax; consequently, meats to be sent to England may be preserved with borax, but they must be prepared in separate rooms and marked with special labels showing that they are for export only.

Sausages, chopped meats, and similar products are the subject of careful supervision. As is well known, such products afford a profitable means of disposing of many trimmings that can be utilized in no other way, and they have long been the object of derisive and

^a Saltpeter is allowed pending a very full investigation to determine whether it is harmful.

mirthful comment. The preparation of sausage has, in the past year, undergone a wonderful change for the better. At the outset it was freely predicted that its manufacture was not practicable without the preservatives and coloring matter which had long been used. The Bureau insisted, however, upon a strict compliance with the law, with the result that manufacturers speedily found it necessary to use more care and cleanliness in preparation, and thus remove at the beginning the causes of the defects which it had been the custom to cover up. The manufacturers themselves are much better satisfied with the new conditions. Their mental attitude is illustrated by the remark of a manufacturer in a small way who, in order to comply with the law, had to spend some \$500 on his plant, and who said: "Why, *now* I am glad to have my friends come in and see how I make sausage."

The preparation of the immense output of canned meats is supervised in the same manner. If in the course of any process any of the meat is discovered to be bad it is condemned, or if when packages are boxed for shipment any are discovered to have become unfit, they likewise are condemned. Many processes are necessary between the arrival of the meat and the shipment of the canned product ready for the consumer. Inspectors are present at all times insisting at every point on purity and fitness in the materials and on cleanliness in workers, workrooms, and utensils. As a further safeguard the Department has equipped and manned branch laboratories at the points of the greatest output. Here, with microscope and reagents, special experts examine the salt, the spices, the pickling fluids, the fats and oils used, with a view to detecting any forbidden preservatives and coloring matters; in short, they bring to the aid of the inspection service the best efforts of modern bacteriological and chemical science. Samples of the finished product are taken at random from stocks, and are even purchased from retailers at distant points. Even the water used, not only here but also in washing carcasses, must pass analytic scrutiny; and several houses accustomed to drawing their supply from contaminated sources have had to abandon the practice.

HONEST LABELING REQUIRED.

Having seen that only wholesome meat is used, and that every possible precaution is taken to have it clean—having, to use a famous phrase, inspected the meat "from the pasture to the package"—the inspectors go one step further, and see that the package is properly and honestly labeled. It is something to know that your package contains good meat, and it is something also to know that you buy what you think you buy. The law attains this desirable end by carefully regulating the trade labels that go on the packages. The Department lays down the broad rule that the label shall tell what

is in the package. This seems simple, but it has led to many curious complications. It had been usual, for instance, to label many mixtures as "potted ham" or "potted tongue," or "deviled" or "minced" ham or tongue. At present, if these labels appear, the can must contain only ham or tongue, as the case may be. Shoulders used to be labeled "picnic hams," or "California hams." They must now appear as "picnic shoulders" or "California shoulders."

Geographical falsities have also disappeared. We used to see a ham labeled "Westphalia ham," or "York ham," the inference being that it came from Westphalia, Germany, or York, England, localities famous for their ham products. These hams now appear as "Westphalia style," or "York style," or "York cut" hams. In the same way we used to see "farm sausage," "Oxford sausage," or "Vienna sausage," accompanied by a picture of the old farm kitchen or of the spires of Oxford or of the banks of the blue Danube. The word "style" is now insisted upon in each case. Even frankfurter and bologna had to be so modified.

It was quite common to designate lard by a name in which the word "leaf" appeared, often accompanied by a picture of a leaf, the plain inference being that the contents of the can were leaf lard. Such names and designs no longer occur unless the lard is made wholly from the leaf fat of hogs. Packages now labeled "pure lard" must be made of sweet, clean, clear hog fat, with the addition of not more than 5 per cent of lard stearin, in order that the lard may not easily melt in hot weather. "Kettle-rendered lard" must be actually so rendered, and "country lard" is no longer made in the city packing house, its place being taken by "country-style lard;" that is, lard made in the city usually, but made after the manner of the country product. Veal loaf must now be made wholly of veal. The meat-inspection law gives no control, however, over the canning of poultry or fish.

TANKING OF CONDEMNED MEATS.

Reference has been made to condemning carcasses and meats to the tanks. The law orders the Secretary of Agriculture to destroy for food purposes all carcasses or parts which are found unfit for food. All large establishments provide tanks for this purpose, as in this way the grease may be saved for soap and other nonedible products and the remainder for fertilizer. Tanks vary in size with the size of the establishment and its volume of business. They are of metal and extend through two or more floors of the house. From the nature of their usage they must be very strong and tight. Government employees first seal the lower opening of the tank. They then see that condemned carcasses, parts, and meat products are put in, along with offal, or coloring matter. They attend to closing and sealing the top, closing and sealing the draw-off valves, see that steam is turned into

the tank, and require it to be maintained at a certain pressure for a prescribed time. A pressure of 40 pounds is usually used. This produces a temperature of 280° F., and, maintained for eight to ten hours, is sufficient to liberate all the grease and even to disintegrate the bones. Inspectors watch also the drawing off, which is done by means of valves located at intervals along the sides of the tank, and they mark the containers in which the product is stored and shipped with the word "inedible." All possible precautions are taken to prevent this grease, some of which looks about as good as some lard, from going into trade as edible product.

FARMERS AND RETAIL BUTCHERS AND DEALERS EXEMPT.

Farmers living near the boundaries between States often find a market in the adjoining States for the animals they kill on the farm. Retail butchers and retail dealers similarly situated must also in the course of business send their meats across the line. To inspect at time of slaughter every farm-killed animal is impracticable, as also is an inspection and labeling of each piece of meat sent out by the retailer to his customers. The law, therefore, exempts from inspection the animals killed by the farmer on his farm and the product sent out by retailers to their customers, providing, however, that should such persons send unfit meat into interstate commerce they shall be punished by fine or imprisonment. This merely changes the manner of operation. The law here becomes retributive instead of anticipatory. Such traffic is still under the supervision of the Department, and the Department provides a form of certificate which the farmer may fill out for each shipment of meat when he presents the shipment to the carrier. It provides a similar form of certificate which the retailer is obliged to fill out and send along with his shipments across the State line, and, inasmuch as the retailer has usually a fixed place of business, it assigns him an exemption number, which must appear on the certificates. These certificates eventually reach the Washington office. The permission, or exemption, does not permit the persons to whom it is issued to ship unfit meat nor exempt them from the penalties of such action; the whole procedure is merely an effort to bring about in another way the same result—that of securing sound meat—in the business of two classes of dealers whom it seems impossible to reach by the ordinary inspection.

For these two exempted classes State abattoirs should be erected and the State should take up the work where the Federal Government leaves off. Thus the meats of farmers and retailers could be inspected by local State inspectors whose regulations should be as strict as those of the Department.

SAFEGUARDS ON THE INSPECTION.

It thus appears that the meat-inspection law of the United States is an advanced and stringent measure, and the regulations of the Secretary of Agriculture made thereunder fully carry out the intent of the law. If, then, the regulations are enforced, our own country, as well as those countries which buy our meats, may be assured of a clean and healthy supply of this food. That the regulations are enforced is capable of demonstration by an examination of the reports of the number of animals condemned. Other safeguards, however, are provided. The law promises to fine not less than \$5,000 and to imprison for at least a year any man who gives anything of value, even a piece of meat, to a Government employee to influence him in the performance of his duties; it is stricter still with such employees, for it holds over them the menace of similar fine and imprisonment if they accept anything of value, no matter what the intent of the donor or the purpose of the gift may be. It is thus dangerous for the packer to bribe, and it is more dangerous still for the employee to accept.

The Bureau places further obstacles in the way of collusion between inspector and owner by frequent changes at the larger stations of employees from house to house, and by changes, less frequent, of employees from station to station. It is working constantly, also, to secure uniformity in the inspection at all stations. It has a very complex system of reports, and its experts scrutinize these with the view of discovering abnormalities in results and making the proper corrections. Again, practically all the operations of slaughtering and preparing meats are open to the world, and are, indeed, in the larger centers, one of the sights to which visitors flock. It is well known that accredited representatives of foreign governments, expert and otherwise, see all the processes of inspection, and more than one has satisfied himself and his government, sometimes to the surprise of both, that inspection is all that it is claimed to be. Publicists also spend days in the stock yards and packing houses, embodying the results of their observations in articles that have recently been of a more favorable tone than they were one or two years ago.

On the whole, it is submitted that no material dishonesty in the inspection can long exist, in view of the above methods and facts, and owing further to the involuntary espionage that each employee undergoes from his fellow-employees, which, while it is not depended upon by the Department, is yet a powerful factor in maintaining a strict integrity in the enforcement of the law.

PERSONNEL OF THE INSPECTION FORCE.

Whatever weight should be given to a high standard in the personnel of the inspection force must also be allowed. The Bureau's employees are both capable and expert. The men in charge of all stations where slaughtering is done, and the men who do the post-mortem work at all stations, are veterinarians. These men must first have successfully completed a three years' course in veterinary medicine at a reputable veterinary college. The Department recognizes only 14 such institutions, excluding several so-called colleges that aspire to cover this field of knowledge. The Civil Service Commission examines these graduates, and about 50 per cent of those examined make the required grade of 70.

For the relief of those who think that everything necessary to the appointment of a man in this service is a letter written to the Secretary of Agriculture by an influential citizen, it may be stated that the Department makes absolutely no permanent appointments except of men whose names are certified to it by the Civil Service Commission. During a period of six months one so appointed is on probation, and if he fails to measure up to the requirements he is dropped. If at the end of this six months he attains his absolute appointment, he is not at once freed of supervision and clothed with full authority to pass or condemn. The force is large, and he is so placed on it under experienced inspectors that he may learn the law and regulations and the methods of their application. A set of rules, supplemented, of course, by some necessary discretion on the part of the heads of the service, govern his advancement in authority and salary. On the latter men rests the burden of inspection. The Bureau holds them responsible, and they well understand that their promotion depends on efficient and faithful service. They have ample opportunity to become experts in detecting diseased animals, and they do. The Department demands all their time during the working day, and a man must be dull indeed if in the days, months, and years spent amid the swift work of the killing floors he fails to develop a most masterly dexterity in discovering abnormalities in the carcasses that come before him.

The laboratory inspectors constitute another class of employees. They also are selected through civil-service examination in the principles of bacteriology and chemistry, with special application to meats.

A third grade of employee is the inspector's assistant. Being under the direction of the veterinarian, he is not required to be himself regularly educated along this line. He examines live stock, tags animals, stamps carcasses, seals cars, patrols the houses at night, superintends the removal and tanking of condemned carcasses—in

short, he does everything he can, where expert pathological knowledge is unnecessary, to relieve and assist the veterinarian.

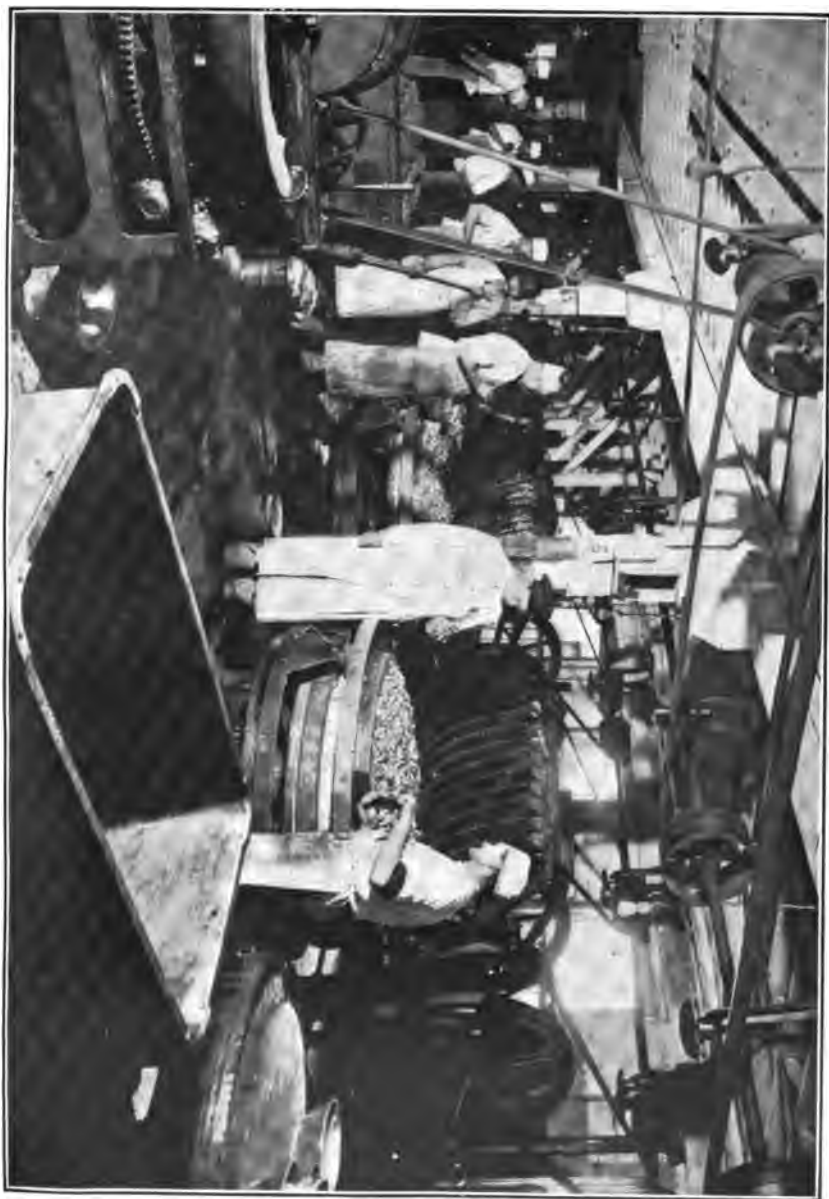
The meat inspector is a fourth class. He is expert in pickling, salting, smoking, and otherwise curing meat. He likewise enters the service through the civil service examinations, and his previous experience is taken into account in grading him. By means of the educated senses of sight and smell he can tell when a piece of meat is unfit, and he knows whether it is irretrievably bad or whether it can be utilized. This class of employees condemned 14,000,000 pounds of meat in the fiscal year 1906-7.

The Bureau selects certain of the most experienced veterinary inspectors and meat inspectors, divides the country into districts, and sends these men traveling through them, visiting every station and every plant. Their visits are unannounced, and they submit reports with recommendations to the Washington office. They are able, out of their wider experience, to instruct the inspectors in charge at the various stations, and their reports are of great value to the Department in its efforts to secure a uniform inspection and to learn of insanitary conditions and have them corrected.

THE NEED OF SUPPLEMENTING THE FEDERAL INSPECTION BY STATE OR MUNICIPAL INSPECTION.

After the Federal Government has gone to so much trouble and expense, as elaborated in the foregoing pages, to provide the citizens of this and other countries with a wholesome meat supply, it becomes the duty of the housewife and the chef to examine the meat after its receipt from the retail dealer to determine if it is still clean and wholesome, and to keep it so until ready to serve. To their assistance can come the local municipal health inspector, who should see that the markets are kept clean, and that tainted and soiled meats are condemned.

Indeed it is hoped that the foregoing description of the operation of the Federal meat-inspection law has shown its limitations and the consequent necessity that it be supplemented by State and municipal inspection. That the inspection of meats is even more necessary at the smaller than at the larger plants of the country is indicated by the comparative results of cattle inspection at these two classes of plants, as shown in the table below. The larger plants had inspection July 1, 1906, and appear in the first column. The smaller plants, coming under the inspection after July 1, appear in the second column. Both classes do an interstate business. It will be seen that relatively twice as many cattle were condemned for tuberculosis at the smaller plants, and nearly twice as many for all causes.

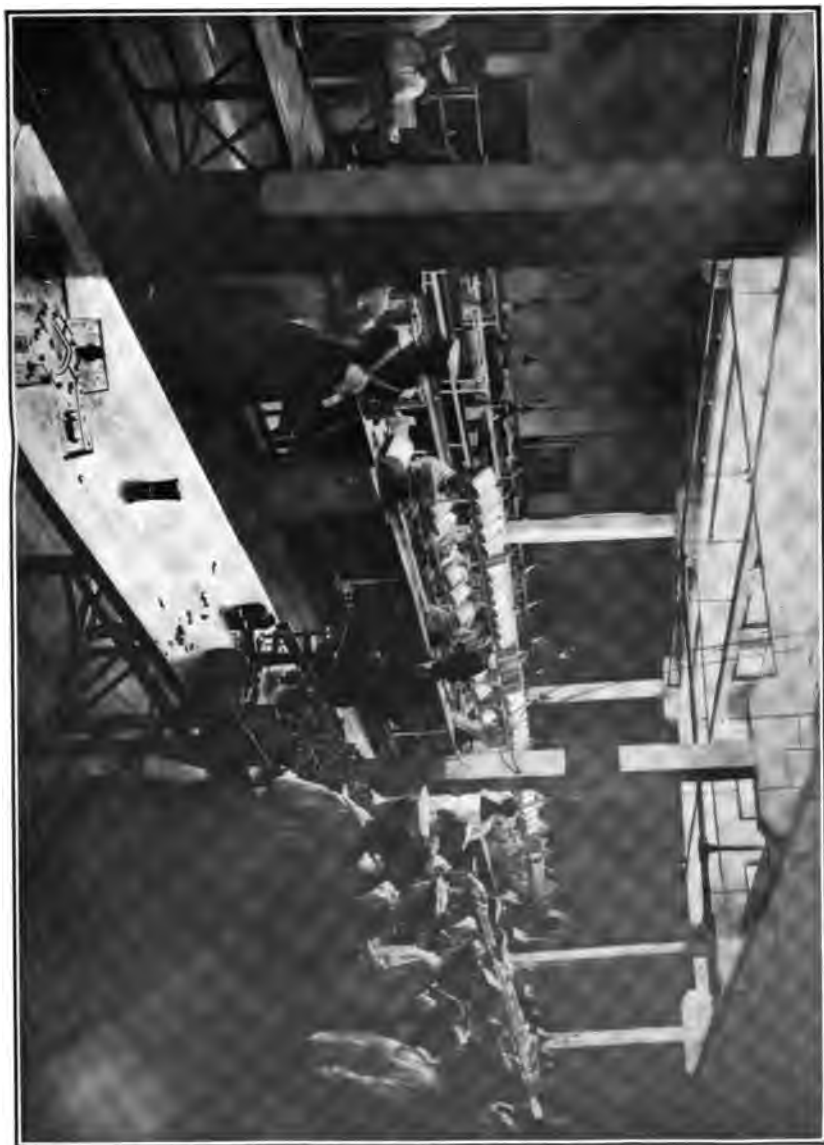


SAUSAGE-CHOPPING ROOM.

[Where sausage is prepared under supervision of government inspectors.]

SAUSAGE-STUFFING ROOM.





PACKING CHIPPED BEEF UNDER GOVERNMENT SUPERVISION.

Result of post-mortem inspections of cattle, July 1, 1906, to June 30, 1907.

	At establish- ments hav- ing inspection July 1, 1906.	At establish- ments granted inspection af- ter July 1, 1906.
Total number inspected.....	7,203,943	417,774
Total number condemned.....	25,308	2,625
Per cent condemned of total inspected.....	0.35	0.62
Number condemned for tuberculosis.....	17,168	2,137
Per cent of total inspected condemned for tuberculosis.....	0.25	0.51

It may with reason be supposed that the local slaughterhouse needs inspection even more badly than the small plants now under Federal supervision. The boast of "home grown" and "home killed," formerly often heard, is empty. "Home grown" may be all right, but it is sometimes dangerous, as when the local butcher's supplies are drawn from the surrounding dairy herds, since the cattle of such herds are particularly susceptible to tuberculosis. "Home killed," however, in the absence of Federal, State, or municipal inspection, too often means that the animal is killed without scientific inspection either before or after slaughter. It may be infected with some of the most dangerous and loathsome diseases in the list and the unskilled butcher never know it. Too often, too, this phrase means that the killing is done in a small, poorly equipped slaughterhouse, without running water and without sewerage, and where the word "sanitation" is unheard and unknown.

Again, if the butcher happens to be located in a town where inspected houses are situated, or near such a town or city, it is not unreasonable to suppose that sellers having suspicious looking animals will send them to him rather than to the inspected houses where they must run the gantlet of expert examination and the risk of reaching the offal tank. More than one instance of the kind is known to the Bureau. In fact, a little reflection shows that the whole tendency of the more rigid inspection under Federal law is toward more care on the part of buyers—the refusal on their part to buy suspicious looking animals except subject to inspection—and the consequent diversion of such animals to the local abattoir that has no inspection.

PORK NOT EXAMINED MICROSCOPICALLY FOR TRICHINÆ.

While the Federal meat inspection in this country is as thorough as a comprehensive law, stringent regulations, and a liberal appropriation of money can make it, and the consumer of meats bearing the stamp "U. S. Inspected and Passed" may in general have the comfortable assurance that he is buying and eating products from healthy animals prepared under clean and sanitary conditions and the danger of contracting disease from eating these meats is practi-

cally eliminated, yet the fact should not be overlooked that there is one disease against which the meat inspection legend does not pretend to be a safeguard. For the detection of most of the diseases affecting meat the human eye needs no assistance. The disease called trichinosis, however, to which hogs are subject, is caused by a parasite so small that the microscope must be employed to detect it. Thorough curing or thorough cooking of the meat kills this parasite. It seems, however, that some European peoples have a habit of eating raw or half-raw pork, and consequently they have suffered from this disease. Very elaborate measures have been taken in some countries to do away with or to lessen the danger. In Germany, for instance, there is an army of inspectors who use the microscope to detect these parasites in pork. These countries some years ago forbade the importation of American pork products unless they had been microscopically inspected. To meet this requirement the Bureau instituted several years ago a system of microscopic inspection of pork intended for shipment to such countries. No microscopic inspection of pork intended for home consumption, however, has ever been made or even contemplated. The Department takes the ground that from the nature of the disease an examination of certain parts of a hog carcass can only minimize and not eliminate the danger.

The parasites, it is true, are usually found, if found at all, in certain parts, as the pillar of the diaphragm, the psoas muscle, the inner aspect of the shoulder, or the base of the tongue. Not finding them in these parts by the usual methods, it may be assumed to be probable that they do not exist in the remainder of the carcass. This is, however, only a probability, as they may exist, and even to such an extent as to produce disease if the flesh is eaten raw. Many cases are on record where twenty, even thirty, examinations were made before trichinæ were found; and out of 6,329 cases of trichinosis in Germany, between 1881 and 1898, a careful inquiry traced 2,042 cases (over 32 per cent) to meat which had been microscopically examined and passed as free from trichinæ. In view of these facts the Department has regarded it as utterly impracticable to inspect hog carcasses for this disease. It has further taken the view that such inspection—which as formerly carried on for exported products would cost about \$3,700,000 a year if all hogs killed at inspected houses were so examined—would do more harm than good. It would create in the minds of the consumers a feeling of false security, which might lead them to omit the only sure means of escaping danger, namely, to refrain from eating uncooked or uncured pork; and it would thus defeat its very purpose and render the great trouble and expense worse than useless.

Not only has the Department not inspected for trichinæ the pork consumed at home, but it has abandoned recently such inspection of

pork products going abroad. It was found that even after our elaborate examination some foreign countries, although requiring our inspection, paid no attention to our certificates, and conducted an examination of their own, on the result of which depended the admission of the products. On the ground, then, that our examination was superfluous, the Department stopped it. Of the principal countries formerly requiring certificates of this examination Italy and France already have agreed to admit our products without them, and upon the certificate simply of the regular inspection under the present law. It is hoped that other countries will take similar action.

MEAT INSPECTION IN EUROPEAN COUNTRIES.

Those European countries which afford markets for our surplus meats all have more or less effective and interesting systems of meat inspection. While owing to the density of population in several of these countries, and the fact that they are not economically suited to purely pastoral pursuits, it is impossible for them to grow all the meat necessary for their own consumption, yet they slaughter large numbers of animals. Of these countries England offers the most desirable market and has in fifteen years taken over half our entire exports of meats. Germany and France, in spite of repeated efforts, have been unable to supply their own demands to the extent of bringing prices within reach of the poorer classes, and present the next best market for us. In the countries named efforts toward meat inspection antedate our own by many years, for local decrees and ordinances may be found as far back as the Middle Ages; but inspection by veterinarians, on scientific principles, and under control of State or Federal governments, is comparatively new.

UNITED KINGDOM.

In Great Britain it was an offense punishable at common law to sell for human food unwholesome meat, knowing it to be such; but statutory provisions are now in force, embodied in separate acts for England and Wales, Scotland, Ireland, and the administrative county of London. The acts for England and Wales, for Ireland, and for London are much alike. In general they empower medical officers of health or inspectors of nuisances to examine at any reasonable time any carcass or meat on sale for human food, and any such carcass or meat that appears diseased, unsound, unwholesome, or unfit for the food of man may be seized and carried before a justice, who may condemn it and order it destroyed. This is of course not meat inspection in the modern sense of the term. The meat is not inspected at slaughter. This system results in condemning great quantities of meat, but in distinction to our own system it is retrospective rather than preventive. The Scotch public-health act is

more specific, for it provides for inspection by veterinarians, both ante-mortem and post-mortem, and inasmuch as the country is well supplied with public abattoirs under municipal ownership and control, the meat-inspection system of that country more nearly approaches our own, although without our elaborate system of marking.

FRANCE.

Meat inspection in France, as well as in Germany, may be divided into two periods, the first of which embraces the time when inspection of meat was merely an incident of the sanitary regulation of traffic in food products, and the second period, which is comparatively recent, when the inspection of animals and of meats intended for human food was placed under the more scientific supervision of veterinarians. In France provision for a veterinary supervision of slaughter at abattoirs was authorized in 1882. Previous to that time inspectors for public slaughterhouses generally were recruited from among butchers and other persons who had some knowledge of animals and meats. The meat-inspection service at the present time is under the general supervision of the ministry of agriculture, and under the more immediate control of the police prefectures. It is based on a series of laws, ministerial decrees, and regulations, rather than on a concrete law covering the entire subject as in the United States and Germany. The municipal authorities also issued special regulations which had as their object the total or partial seizure of unwholesome meats or the exclusion from abattoirs of animals unfit for food. Severe criticisms of the meat inspection of France have been written by eminent French authorities. Inspection in private abattoirs is not practiced generally in France, only four Departments having made any efforts in this direction, and where such inspection is in force it does not come up to the standard maintained in public abattoirs.

GERMANY.

The first imperial meat-inspection act in Germany was passed in June, 1900, and went into effect in its entirety in April, 1903. Previous to that time no general law governing the inspection of live stock and meats existed in the Empire. A law passed in 1879 for the regulation of traffic in food products, and also the imperial code of penal laws, contained regulations for the protection of human health from unfit meat brought into trade, but these laws simply provided for criminal procedure after the deed, and not for measures to prevent the sale of meat unfit for human food. Some individual States, especially in southern Germany, and the free cities of Hamburg, Bremen, and Lübeck, had decrees providing for inspection. The imperial meat-inspection law has made inspection

practically compulsory, although exception is made in the case of private slaughter. Notwithstanding the strict conditions of this law, which is especially enforced against foreign meats and meat food products, it is optional with the consumer whether he shall eat the meat of diseased animals, the law requiring simply that an examination shall be made and that the consumer must be notified regarding its condition, and only meat which according to the German standard can not be rendered harmless by cooking, steaming, or pickling can be condemned and destroyed. Imported meats must be inspected by an approved veterinarian. In the case of fresh meat, each individual carcass must be inspected, and when the presence of harmful preservatives is suspected it must undergo a chemical analysis. The flesh of hogs is microscopically examined to determine the presence of trichinæ.

The inspection service of Germany is divided into districts, for each of which at least one veterinary inspector and one assistant inspector is appointed. In Berlin, where the largest slaughtering takes place, and which comprises one district, 63 veterinary inspectors were employed in the year 1904-5. In addition to the district veterinary inspectors there is a large force of inspectors who are not veterinarians, but who examine animals and meat and pass judgment on them when no signs of disease are manifest. In the larger districts the inspectors devote all their time to the work, but in the smaller districts the inspector is called upon to make inspections at private and other slaughter, and as a rule his time is not fully occupied. In the rural districts the meat inspector may also inspect for trichinæ, while in the large districts such inspection is done by a special force of microscopists. The number of inspectors for trichinæ for the whole Empire has been variously estimated at from 25,000 to 100,000. In Prussia alone, according to official statistics, there were 28,108 inspectors, and the total cost of inspection for trichinæ in the Empire was estimated at \$3,275,000.

Of the meat-inspection systems of European countries that of Germany is the most elaborate. In Germany the tuberculin test shows from 25 to 40 per cent of the cattle to be tuberculous. Post-mortem examinations at some of the slaughterhouses of the Empire confirm this percentage. In the United States the tuberculin test shows from 2 to 10 per cent of the cattle to be tuberculous. The wide variation in the figures in both cases is due to the fact that different localities are differently infected. In the United States the older and more thickly populated portions of the country are as a rule the worst infected, especially those localities where there are numerous dairy herds, for this disease prevails to a very much greater extent among dairy cattle than among others. The least infected cattle are naturally those from the ranges, and the larger part of the cattle

slaughtered at the establishments under Government inspection come from these ranges.

So many different factors enter into the question that it is not possible to make a perfectly satisfactory comparison of the inspection systems of Germany and the United States. Germany, as shown, has from five to seven times as much tuberculosis in cattle as the United States. Her law runs throughout the Empire and covers the small slaughterhouses, while that of the United States applies in practice to only the better class of animals—those killed for the interstate and export trade, coming mostly from the ranges and slaughtered at the larger houses, and has no control of the insanitary local abattoir. Bearing these facts in mind, it is interesting to note that during the year ending June 30, 1907, the inspection system of the United States condemned 0.36 per cent of the cattle inspected, while that of Germany in the year 1905 (the last year for which figures are available) condemned 0.97 per cent, relatively only about three times as many; and that the United States condemned 0.33 per cent of the total number of hogs inspected as compared with 0.12 per cent condemned by Germany.

THE FIRST SEASON'S WORK FOR THE ERADICATION OF THE CATTLE TICK.

By RICE P. STEDDOM, V. S.,
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Ever since the Bureau of Animal Industry of the United States Department of Agriculture discovered the fact that a certain species of tick, now known as *Boophilus annulatus*, is the medium through which the infection of disease is conveyed to cattle, a quarantine line across the United States has been maintained for the purpose of preventing the further spread of these parasites, which, as a rule, are carried only by cattle of the southern portion of the country. The quarantine has been maintained through the efforts of the Federal Government, assisted by the interested States and Territories, with but varying success, as may be observed by noting the positions the line has assumed during the past fifteen years.

It may be argued that the effort to control the cattle traffic from the South has been misdirected; that if the unrestricted movement and intermingling of cattle were permitted the ticks would be scattered throughout the land and gradually become acclimated to the conditions of the North, with the result that finally all our cattle would become as the southern cattle now are—immune to tick fever—and then the presence of the tick would no longer be a menace. While there is no doubt that the tick is capable, to a certain extent, of adapting itself to climatic conditions, it is not at all probable that it could ever survive the severe winters of the North. Were this possible, however, and were all the cattle of the United States to become immune to this fever, this very condition, desirable as it is where ticks exist, would mean millions upon millions of dollars annual loss on account of the detrimental effect that such immunity inflicts upon the animal economy. Moreover, the process of immunization would be at the cost of millions of cattle and the financial ruin of the owners.

It is therefore plainly apparent that while the ticks are with us some restraining action is absolutely essential for the preservation of the cattle industry. It is also obvious that something should be done—some radical step taken—with a view of terminating, as early as practicable, this constant running fight with the tick. An important advance in this direction was made by the recent action of Congress, to which reference will be made later.

DIFFICULTY OF MAINTAINING THE QUARANTINE LINE.

It is comparatively easy to designate an imaginary line following State and county boundaries extending from the Pacific to the Atlantic oceans, thus dividing that part of our country which is free from the infection of tick fever from that in which the infection is present, and to formulate rules and regulations to govern the cattle traffic between those two sections of the country; but it is quite another matter to get the owners and shippers of cattle to recognize the importance of maintaining such a line and of observing the regulations. This has been one phase of the Government's work for many years; but it has been impossible to guard against infractions of the regulations. Thus from time to time cattle carrying fever-producing ticks have been taken to localities where nonimmune cattle would become infested, and consequently the quarantine area had to be extended to include the ticky section. Not only this, but by such extension of the infected area the nonimmune cattle die in great numbers when ticks become attached to them, the fatality not infrequently reaching 90 per cent of the entire herd. It is on account of these death-dealing ticks that the quarantine is imposed on the cattle of some of the Southern States. Here the question arises: What is to be accomplished by quarantine alone, since it is only a temporizing measure? In reply it may be said that the maintenance of the present conditions will not cure the evil, and without some additional action no progress can be made in dealing with the situation. The quarantine must be supplemented by eradication of the ticks, for these parasites are the root of the whole trouble.

A PLAN FOR COMPLETELY ERADICATING THE TICK.

It is entirely feasible to annihilate the fever tick which is the cause of all the loss and hardship. The United States Department of Agriculture and some of the States have shown conclusively that by excluding animals from premises for a few months the seed ticks which remain will perish for the want of a host, as they can not mature without the blood of an animal. If at the expiration of the required time after removal the cattle are carefully cleaned of ticks by hand picking and greasing, or by dipping them in or thoroughly spraying them with crude petroleum, and are then returned to clean premises they will remain free from ticks. By these and similar methods neighborhoods, counties, and whole States may be disinfectd.

Under the provisions of the act of Congress approved June 30, 1906, appropriating \$82,500 to enable the Secretary of Agriculture to undertake experimental work in cooperation with State authorities

in eradicating the ticks transmitting southern cattle fever, the Department has for some months past been assisting the States and Territories from California to Virginia along these lines. Anticipating the action of Congress, an investigation had been made respecting the laws of the various States, and inquiry was made through the various attorneys-general relative to the existence of State laws under which the Government could undertake the work of tick eradication. It was found that while some State laws afforded ample provisions, other States either had no laws bearing on the subject or the statutes were inadequate. However, the work is being pushed by the Department as far as possible in all of the different sections, and in some localities the prospects are very encouraging.

DETAILS OF FEDERAL AND STATE COOPERATIVE WORK IN 1906.

It may be of interest to know something of the detail of the actual operations of the campaign against this common enemy. The matter of cooperative work by the Government was early taken up with the proper officials in the States and Territories interested, and arrangements were made for the Department to cooperate with them to the extent that their respective laws would permit. The first step consisted of a consultation between the State authorities and Department representatives, at which feasible working plans were agreed upon. The memorandum of agreement between the States and the Government indicates, in a tentative manner, the plan for cooperative work. Under these arrangements the work has been done in close cooperation with the local authorities, who were permitted to designate the counties or localities to be covered and to recommend for appointment as agents of this Bureau competent men acquainted with the local conditions in the respective localities. The detail of operation varies in some instances in order to conform to the State laws and regulations, but the main object to be accomplished in all cases is the destruction of the ticks. It is, of course, essential first to locate the infected animals and premises. This is done by careful inspection of all cattle in a county or section which has been chosen as the most suitable locality for work. The zeal with which this work has been done in the different localities is exceedingly encouraging.

As previously indicated, the methods employed necessarily differ greatly so as to accord with the requirements of the different sections. For instance, in order to examine western cattle carefully for ticks, both the local and Federal inspectors in that section must be men experienced in the saddle and be able to rope and confine suspicious cattle wherever found, either on the open range or in pastures, with the expertness of old-time cowboys. It is important that a close visual and digital examination be made for the purpose of detecting the presence of the parasites. To expedite the work, these men often

travel by twos from ranch to ranch, taking care to locate all infested animals and premises. When their work is finished for the day the inspectors do not return to town or even to a ranch house, but seek their own camp, which has been moved onward a convenient distance since the previous night. Twelve men and a cook usually compose each camp outfit, which is moved over the country in a systematic manner. Whenever infested animals are found the owner is informed of the most practical method of getting rid of the ticks. On ranches where large numbers of cattle are kept it is frequently practicable to remove all of them to one portion of the ranch until the vacated portion is disinfected by starving the seed ticks which remain. Then the cattle are dipped in or sprayed with crude petroleum and returned to the disinfected premises, and it is only a matter of excluding animals from the other portion for a few months, when the entire ranch is clean. Under this plan sheep may safely occupy the premises infected by cattle, but it should be remembered that no horses or mules should be allowed therein, for these classes of animals may become infested with and perpetuate the ticks.

In the Southeast, where the herds are smaller, the plan of operation is confined to the rotation of pastures, the hand picking and destruction of ticks, and the application of parasiticides. In order to enlist an active interest, meetings are held in the various counties for the purpose of discussing the general subject of tick eradication and devising means to meet the local requirements.

The territory in which it was desired to operate was divided into five sections, as follows: (1) California; (2) Texas, Oklahoma, Missouri, Arkansas, and Louisiana; (3) Kentucky, Tennessee, Alabama, and Mississippi; (4) Georgia and South Carolina; (5) Virginia and North Carolina.

The work was organized as soon as possible after the passage of the law, but it was late in July (1906) before it could be begun at all, and even later before it could be taken up in some sections.

As the conditions in the different sections were widely divergent, the plans of procedure and methods employed necessarily varied greatly. In some States meetings were held at which the subject of tick eradication was discussed with farmers, stockmen, and other interested citizens. These meetings were intended to be largely educational, but they gave an opportunity to petition State authorities for relief and to express preference for local inspectors, thus developing an enthusiasm and interest that can only come from a close personal identification with an enterprise of this sort. It was found advisable to buy a carload of crude petroleum (in barrels) for use in the treatment of infested animals; this oil was distributed and used under the immediate supervision of inspectors of the Bureau in the Southeastern States, and was doubtless the means of doing what could

have been done in no other way, as the crude oil was difficult to obtain in small quantities at points far distant from its production.

The following table shows, by States, the number of herds inspected, the number of cattle inspected, the number found free of ticks, and the number found to be infested:

Statement of inspection for cattle ticks, 1906.

State.	Inspections.				Number of counties.
	Herds.	Cattle.			
		Free.	Infested.	Total.	
Alabama	780	4	5,550	5,554	2
Arkansas	1,527	6,671	2,332	9,008	2
California	1,015	67,517	58,889	126,406	11
Georgia	4,474	10,053	6,865	16,418	7
Kentucky	4,077	13,658	7,832	20,985	4
Missouri	126	8,000	1,430	4,430	3
North Carolina		7,203	1,632	8,835	3
Oklahoma	10,569	97,860	16,972	114,832	5
Tennessee ^b	6,317	23,204	15,840	39,044	17
Texas	410	86,682	99,175	185,857	17
Virginia		12,217	5,263	17,480	11
Total	29,315	328,064	220,780	548,844	82

^a In addition, in Kentucky 1,396 herds and 6,904 cattle were reinspected.

^b In addition, in Tennessee 822 herds and 4,174 cattle were reinspected.

THE WORK BY STATES.

Following is a résumé of the work done and the results accomplished in each State during the year 1906:

Alabama.—In Alabama the work was largely of an educational character—instructing owners of cattle regarding the work of tick eradication and methods of disinfection. The work was done by three Bureau employees in two of the northern counties, Limestone and Madison, and included the inspection of 780 herds containing 5,554 head of cattle. The infection in these counties is general; and while there is no State law under which effective work can be done, the people are so alive to the situation and give such cordial support to the work that there is reason to believe that permanent results may be accomplished by resuming the work early in the spring of 1907.

Arkansas and Missouri.—Northwestern Arkansas and southwestern Missouri, lying contiguous to the infected area of the Indian Territory, themselves became infected, and some work was done in five counties in that section. Three men report the inspection of 1,653 herds, containing 13,433 head of cattle.

California.—The work, covering the inspection of 1,015 herds containing 126,406 head of cattle, was done by eight veterinarians and one agent and was confined largely to the counties below the quarantine line from which shipments were permitted after inspection, viz, San Luis Obispo, Madera, Fresno, Kings, Tulare, Kern, and Merced. Some work was also done in Santa Barbara County. Herds known

by local authorities to be infested were first located and inspected; then herds adjacent to these were carefully inspected, the aim being to locate and quarantine as quickly as possible all infested herds. These were disinfected. It is expected that with continued work along the same lines the counties of Merced, Madera, Fresno, Kings, Tulare, and Kern may be released from quarantine before the close of the year 1907 and that the counties of Santa Barbara, Ventura, Los Angeles, and San Bernardino may be placed within the provisionally quarantined area. This will be the more easily and more certainly accomplished if, as is hoped and expected, the legislature of California enacts a more satisfactory law and makes a specific appropriation of funds to be used in connection with the Department in tick-eradication work.

Georgia.—The work in Georgia was confined to seven counties in the northeastern part of the State, as follows: Stephens, Habersham, White, Dawson, Pickens, Gilmer, and Fannin. It was at first largely educational and met with the hearty approval and cordial support of farmers, stock owners, and others interested. In addition to the educational work, the thirteen Bureau employees engaged inspected 4,474 herds, containing 16,418 cattle; and while the percentage of infection was very high in some of these counties, in three—Stephens, Habersham, and White—it was so low, and the work of disinfection progressed so well, that they can probably be placed within the provisionally quarantined area before the close of the year 1907. It appears that a large majority of the better and representative citizens of the counties covered have given their support to the work, and that with the resumption of work early in the spring of 1907 a number of other counties may be either added to the provisionally quarantined area or entirely released from quarantine.

Kentucky.—For some years past it has been necessary to include within the provisionally quarantined area a few counties in southern Kentucky lying contiguous to some of the infected counties of Tennessee. The number so included had been reduced to two counties, Clinton and Wayne, but slight infection was also found in two adjoining counties. The entire matter was taken up with the State board of health, and that body on August 1, 1906, issued a proclamation placing a quarantine upon these counties and conferring upon the employees of this Bureau the authority of sanitary inspectors of the State board of health. Under this arrangement the counties were thoroughly covered, with the result that they have been removed from the provisionally quarantined area. This work was done by seven Bureau employees and included the inspection of 4,077 herds, containing 20,985 cattle, and the reinspection of 1,396 herds, containing 6,904 cattle. Under agreement with State and county authorities,

the remaining infested animals and premises will be kept under quarantine until disinfection is complete.

Louisiana.—On July 13, 1906, a Bureau inspector was directed to make a general survey of the conditions with a view to ascertaining what work in the line of tick eradication might be attempted in Louisiana. The meat-inspection work at New Orleans prevented him from making the investigation until late in September. He reported to the effect that whatever was done there would have to be done in connection with the crop pest commission, which was not in favor of vigorously enforcing the quarantine of infected live stock and premises. He recommended the liberal distribution of literature for educational purposes, and this has been and is now being done.

A Bureau inspector was instructed to make a thorough investigation of the Gulf country of Louisiana, as it had been represented that sections of it were free from fever ticks. If the report of his investigation bears out the representations that have been made, the necessary steps will be taken to permit the shipment of cattle from such sections without restrictions.

Representatives of the Bureau attended a meeting of the Association of Official Entomologists of the Cotton Belt, at Baton Rouge, at which the subject of tick eradication was discussed. Since their return from that meeting one of them states that, when the cattle owners desire, portions of Louisiana will be easy to clean up, as the cane fields offer especial advantages.

North Carolina.—The cooperative work in North Carolina has been with the State board of agriculture, through its veterinarian and seven inspectors, the Bureau force averaging four inspectors and three agents. Meetings for the discussion of the question of tick eradication have been held, infested herds have been located and quarantined, and other preparations made that will facilitate an intelligent resumption of the work in the early spring. The farm-to-farm inspection was made in three counties, and the inspection of quarantined farms was made in six other counties. The total number of cattle inspected in three counties was 8,835, of which 1,632 were infected. Five whole counties—Polk, Forsyth, Davidson, Cabarrus, and Mecklenburg—and parts of two other counties—Rowan and McDowell—are recommended for release from quarantine, and three others—Rutherford, Yadkin, and Cleveland—are recommended for provisional quarantine.

Ten counties in the northern part of the State and three in the southern part have been agreed upon as working ground for the season of 1907.

Oklahoma.—The governor of Oklahoma and the officers of the live stock sanitary commission gave hearty support and assistance to

Bureau employees in that Territory. The laws are favorable; the stock interests are large, and the necessity for aggressive work looking to tick eradication is keenly felt. The plan followed was that previously described as having been used in the West. A farm-to-farm inspection was made, and wherever infested animals were found the owner was instructed as to the best and most practicable method of procedure in each instance. The advance inspectors were followed a few days later by another inspector, who visited the infested herds and whose business it was to see that the work of disinfection was being properly carried on.

As the laws provide that where the owner refuses to accomplish disinfection the same may be done by the sheriff and the cattle be sold to cover the costs, it was comparatively easy to enlist the cooperation of owners of infested herds. Seventeen Bureau employees and a number of local inspectors were engaged in the work in Oklahoma and accomplished the inspection of 10,589 herds, containing 114,832 head of cattle; and while but one county, Greer, has been placed within the provisionally quarantined area, yet an immense amount of good work was done in other counties, and it is expected that by the end of the year 1907 the counties of Payne, Logan, Oklahoma, Cleveland, and Canadian may be ready to be released from quarantine.

Tennessee.—Plans for a division of the work in Tennessee were agreed upon by a representative of the Bureau and the State livestock commissioner, the counties covered by the deputy State inspectors to be finally investigated by Bureau inspectors with a view to their exemption from quarantine. Thirteen Bureau employees were engaged in the inspection work, and an additional man was employed, who visited twenty-two counties, conferred with county boards, addressed twenty-four meetings on the subject of tick eradication, and through the county press brought the subject to the attention of the general public.

The results have been most encouraging, and the counties and parts of counties mentioned below may now be removed from the quarantined area: The counties of Moore, Cannon, and Cumberland; about one-third of each of the counties of Haywood, Fayette, and Coffee; about two-thirds of each of the counties of Madison and Jackson; about one-half of each of the counties of Clay and Dekalb, and a small portion of each of the counties of Franklin, Putnam, and Fentress. These sections are not entirely free from ticks, but the infested animals are few and are controlled by the State and county authorities under agreement with the Bureau, so that their proper treatment may be carried to completion without danger of spreading the parasites. Up to the end of October 6,317 herds, con-

taining 39,044 head of cattle, had been inspected, 822 herds of which, containing 4,174 head of cattle, being reinspected.

Texas.—On account of the lack of funds the State authorities were unable to employ men who could give their time to the experimental work in Texas, but the regular State inspectors were directed to cooperate with the Bureau to the extent that their other duties would permit. The work was not begun until the end of August, but great interest was shown in some sections, one man—the manager of a large estate—offering \$50,000 on condition that the work be undertaken in his county and with the understanding that his cattle might be given an unrestricted northern market. Eleven Bureau employees were engaged in the work in seventeen counties, and their reports show the inspection of 410 herds, containing 185,857 head of cattle. The indications are that by the end of the year 1907 the counties of Childress, Hardeman, Wilbarger, Cottle, Foard, King, Stonewall, Borden, Howard, Glasscock, and Pecos will be so free from general infection that they may be removed from the provisionally quarantined area.

Virginia.—The cooperation has been between the State board of control and its veterinarian and the county authorities on the one hand, and the Bureau force, averaging about nine inspectors and four agents, on the other. The working force of the State has been forty-one local inspectors, whose employment has ranged from two weeks to three months each. The work was confined largely to eleven counties, though some inspections were made and some educational work was done in five other counties preliminary to the next season's operations. The manner of the inspection was made to make a farm-to-farm inspection of the cattle, usually with the local inspector, and, if premises were infected, to ascertain if they were quarantined, and if not to report the fact to the local inspectors. Such places were thereafter revisited periodically to see if disinfection was being properly accomplished, and in most cases it was found that this was being done. The number of cattle inspected was 17,480, of which 5,263 were infested, many of them being reinspected one or more times.

As a direct result of the season's work in Virginia, ten counties—Franklin, Campbell, Appomattox, Buckingham, Prince Edward, Amelia, Nottoway, Powhatan, and Mathews—with an area of 4,445 square miles were released from quarantine on December 1, 1906, and two other counties were placed within the provisionally quarantined area. There are some infested herds in the ten counties referred to, but they are quarantined, and under agreement with the respective county boards of supervisors they are to remain in quarantine until released by written order of the State veterinarian, approved by the Chief of the Bureau of Animal Industry..

If the work outlined for 1907 is accomplished, as may be reasonably expected, but nine counties will remain in the quarantined area of Virginia.

SUMMARY.

In considering the work done and the results attained thus far, it should be borne in mind that the season was well advanced before the law was passed, and that although some steps were taken in anticipation of its passage, yet the actual plans and organization for the work were late in formation. It should also be remembered that the amount appropriated was only intended to be used to inaugurate the work, and yet, as above set forth, employees of this Bureau have inspected 548,844 head of cattle, and have in connection with local authorities so attended to their disinfection and to the supervision thereof that 45 whole counties and parts of 13 other counties, with an area of almost 50,000 square miles, will probably be released from quarantine before the end of the year 1907. This is an area larger than that of the entire State of Virginia. Plans have been laid and specific work outlined for resumption of active work in the early spring of 1907. The State officers, cattle owners, and others affected are intensely interested, so that the educational work will be carried on, and there is every reason to believe that with proper funds at the disposal of the Department for another season large inroads may be made into the territory now quarantined and hundreds of thousands of cattle be given an unrestricted market, thus giving direct results to an immense number of people. This will stimulate interest in those States in which active interest is now lacking, and will doubtless result in a more general movement against the cattle tick.

If the Congress will continue to sustain adequately these operations, and if the States interested will do their part in the way of enacting favorable laws and appropriating money to be used in this cooperative work, it is believed to be only a question of time when the southern cattle tick in this country will be a thing of the past.

SOME ESSENTIAL FEATURES OF STATE LAWS FOR TICK ERADICATION.

The essential features of a law which should be enacted by every State and Territory having fever ticks within its border are as follows:

(1) Provide for local officials to enter premises for the purpose of inspecting animals.

(2) Provide for the quarantine of infected and exposed animals and premises.

(3) Provide for the enforcement of proper disinfection of infected and exposed animals and premises by the application of parasitocides, such as effective washes, sprays, and dips, and by the changing

of animals from one lot, field, or premises to another, as may be necessary.

(4) Provide for the promulgation of rules and regulations by a duly authorized State official, board, or commission, which rules and regulations shall have the effect of law.

(5) Provide that Federal representatives engaged in the work of tick eradication may be appointed as State or territorial officials without compensation, but with power to carry into effect the provisions of the State laws and regulations. (In some of the States a constitutional amendment will perhaps be necessary before this provision can become effective.)

(6) Provide for State and county funds for the employment and expenses of inspectors with whom the Government officials may work in close cooperation.

The appropriation of funds by the various States for this purpose gives them a more direct and intimate relation with the work and is a stimulus to more lively interest in the undertaking than is manifest when the money is supplied wholly by the Federal Government. If it is not possible for the State to furnish sufficient funds to employ local inspectors, it may be that cattle owners and other interested persons will give financial support to this cause. A considerable amount of money has been tendered the Department of Agriculture by cattlemen who are enthusiastic on the subject of getting rid of cattle ticks. Such offers have necessarily been declined, as under no condition can money be accepted from such a source by the Department. The State, however, may be in a position to receive assistance of this kind and to use it in conducting a successful campaign against the cattle tick. A law in each State governing the subject is essential before any material progress can be made. As is the case with laws governing other matters, it may not be necessary to apply the provisions of such a law except in rare instances.

Experience has shown that the citizens of a locality may willingly and faithfully expend their means and energy to accomplish a common good, while a single neighbor will persistently refuse to do his individual part, and thus the whole scheme is defeated. So in the absence of adequate law a man who declines to control and disinfect his ticky cattle may prevent a whole community from enjoying the privileges of an unrestricted market. The Federal Government can cooperate within a State only under the laws of that State. If it is impossible at present to secure the passage of State legislation making available funds for the eradication of cattle ticks, no State should fail at the first opportunity to at least make it possible for the Federal Government to take up the work within its borders.

When legislation as above indicated is secured in each State interested and adequate annual appropriations are made by Congress

for cooperation with the States, the problem of eradicating ticks will have been practically solved, for it is only a matter of money and men. With the means forthcoming the men will be at hand. The Department of Agriculture is now training scores of men, who in turn will be able to impart their knowledge and experience to others who will be needed when this work is undertaken upon a larger scale.

THE COOPERATION OF CATTLE OWNERS NECESSARY.

Any method of operation which tends toward the early destruction of ticks entails certain temporary difficulties and inconvenience to the parties involved. Those who undertake this work must reckon with the local butchers who are to be supplied with cattle; with the owners of steer teams which are driven on the public highways; with the men who permit their cattle to stray at large, and always with the man who disbelieves the well-established fact that cattle ticks transmit disease. These and other similar problems must be met and dealt with in accordance with local conditions. Once an individual is persuaded of the detrimental effects of the presence of these parasites, he immediately recognizes the necessity of getting rid of them; so, after all, the main difficulty in securing an immediate startling success lies in our being unable to convince the people at once of the harmfulness of their having tick-infested animals. The people, therefore, must be given every opportunity to become acquainted with the reasons why ticks should be destroyed. Their hearty support and cooperation in the work must be enlisted, for without their assistance the undertaking will be of no avail.

When the citizens of a county or group of counties in any one of the infected States enter earnestly upon the task of getting rid of the fever ticks, they may accomplish their purpose without appreciable sacrifice or hardship. When a locality is freed from fever ticks and means are enforced to prevent reintroduction, the Federal Government releases the quarantine so as to permit the interstate shipment of cattle therefrom to any part of the country. The quarantine has been, and now is, directed at the ticks and not against the cattle. The Department of Agriculture stands ready with all the means in its power to assist every State which under its laws can receive assistance in these matters, and not only revokes the Federal quarantine on tick-free sections, but will continue to help to free infected localities of ticks.

THE SUSCEPTIBILITY OF TUBERCLE BACILLI TO MODIFICATION.

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PRELIMINARY REMARKS.

It is a fact well known to bacteriologists that certain micro-organisms may be artificially changed in the degree of their virulence, in their mode of growth, and in their morphology, as a result of deviations in the culture medium, in the temperature at which they are grown, or by their passage through different animals. The attenuation of the *Bacillus anthracis* by submitting it to elevated temperatures, and the prompt recovery of its primary virulence by a single passage through a white mouse, is a notable instance of the manner in which one of the most dangerous and active pathogenic micro-organisms may be transformed. Cattle, usually very susceptible to attacks by this bacillus, may easily survive inoculations with the attenuated form, but after the weakened bacillus has been submitted to a single passage through the very susceptible white mouse it is as dangerous to cattle as ever, having regained all of its former virulence for the latter animals. The diphtheria bacillus becomes promptly attenuated by the addition of a small amount of iodine trichloride to the nutrient media in which it is growing. Swine erysipelas becomes much less virulent by repeated passage through rabbits. The bacillus of blackleg rendered innocuous by a long exposure to high temperature will regain its virulence upon the addition of lactic acid, while the marked decrease in pathogenesis of the rabies virus produced by its passage through monkeys may readily be restored by its injection through a series of rabbits. It is well known that the vaccine prepared by many of the biological houses of this country for the prevention of smallpox was originally obtained from a case of smallpox in a man by passage through a series of young cattle. It is therefore simply a modified form of smallpox, whose harmless attack upon the human system is due to a certain attenuation derived during its passage through the systems of these young cattle. The *Strepto-*

coccus pyogenes and the bacillus of Asiatic cholera rapidly become affected while growing artificially, through the action of the products of their own growth, and unless removed frequently to fresh nutriment they will gradually weaken and die. Moreover, the causative agent of foot-and-mouth disease, according to the recent experiments of Löffler, becomes attenuated by passage through young pigs, while the introduction of the bacillus of Asiatic cholera into guinea pigs rapidly accentuates its virulence for pigeons. Variations in the supply of light will also exert a marked influence upon the character of certain bacteria. The application of direct sunlight to some growing cultures, even for a short period of time, will cause an attenuation in virulence, a disturbance in the production of pigment, or a change in the chemical products of their growth.

Since, then, it is admitted that there are many forms of pathogenic micro-organisms that can be materially altered by increase of heat to their surroundings, by application of direct rays of sunlight, by increasing or decreasing the acidity or alkalinity of their nutriment, by the products of their own growth, or by passage through animals either susceptible or resistant to their action, is it too much to suppose that the tubercle bacillus is also subject to the conditions of its environment and is also susceptible to change in form, in vigor of growth, and in the degree of its virulence to animals that are usually considered susceptible to it? If it is shown that the tubercle bacillus is affected by its surroundings, and that in consequence of such influence it may become longer or shorter, beaded or homogeneous, straight or curved, more intense or more attenuated in its virulence, more rapid or more tardy in its growth under artificial conditions, one may logically reach the conclusion that it would be possible, starting with tubercle bacilli of any particular type, to submit them to certain environments for such a period of time that they would become transformed into some other type without losing their relationship to the parent organism. Further than this, one may be led to suppose that the various types of tubercle bacilli as they are known to scientists at the present day are members of one and the same variable family, although the number of variations to be observed under various natural or created conditions is practically incalculable. These members or types include every grade from the most virulent, stubby individual of the bovine type up through the whole order until the least virulent, slender, curved, and beaded member—one that is incapable of producing tuberculosis in a guinea pig—is reached.

It is now very generally conceded that there is usually a difference between tubercle bacilli which have their origin in certain differing species of animals. The terms "bovine type," "human type," "avian

type," etc., which have acquired such familiar usage in their application to the tubercle bacillus, indicate the universal acknowledgment of the existence of varying characteristics among them. It is not yet proved, however, that this difference is one of species, and it seems evident from the developments of recent investigations, which show the readiness with which the tubercle bacillus may be made to change in morphology, virulence, and in its adaptation to artificial culture media, that it is impossible to establish any positive point at which one type leaves off and another begins.

If the tubercle bacillus grew as rapidly under artificial conditions as some of the other pathogenic bacteria do, the phases of its modification could be more closely watched and more readily determined. But, unfortunately for the immediate settlement of the question of its transformability, its growth is very slow, and experiments must be continued for many months before a suitable number of generations can be obtained for profitable comparison with the culture used at the starting point.

There is much that may be gleaned from the literature now available to lead one to the conclusion that the different characteristics so frequently noted are neither constant nor unchangeable. It has been shown that tubercle bacilli of the bovine type may be made to abandon their typical morphology and to assume forms of increased length, with more or less curvature and beading. This transformation even occurs within the tissues of cattle whenever pulmonary cavities occur or whenever the tubercular lesion assumes the form of a circumscribed abscess, as is frequently seen in tuberculosis of the bones. Continued cultivation upon artificial media gradually increases the length of bovine tubercle bacilli, and the addition of glycerin or paraffin to the medium has been shown to hasten the change greatly.

The infection of a flock of hens through eating of the viscera of a tuberculous cow has been reported, and in this instance the bacilli were sufficiently changed by their existence within the bodies of the fowls to give them the power of readily conveying the disease to other fowls by means of inoculations. Mammalian tubercle bacilli obtained from the horse, the cow, or from man have been so altered by continued retention within the peritoneal cavities of fowls by means of collodion capsules that they finally displayed pathogenic properties when inoculated into the avian tissues. They also changed their forms under these conditions until they corresponded more closely to the avian type than they did at first.

Bovine tubercle bacilli undergo marked changes in form when inoculated into animals that have been immunized against tuberculosis. Passage through cats, rabbits, dogs, hogs, or sheep tends to

lengthen them in certain cases, and also to supply them with more or less beading.

The transformations which have been demonstrated with bacilli of the bovine type have been fully equaled when human, avian, and piscine types have been subjected to modifying conditions. Tubercle bacilli of various types, but of a feeble degree of virulence, have been brought up by means of passage through certain animals to such a degree of virulence that they have proved fatal when injected into cattle or the smaller test animals. On the other hand, mammalian types have been modified until they would grow in cold-blooded animals.

Continued cultivation upon artificial media tends to reduce the degree of virulence of tubercle bacilli, and in old cultures in which short forms at first predominated it will be found that the effect of time has been to increase the proportion of long and curved forms.

These innumerable variations that have been developed in tubercle bacilli by artificial means are fully duplicated by nature in her method of dealing with these minute forms of life, and the remarkable variations which have been noted in different cultures of tubercle bacilli of a single type when first recovered from the tissues of their natural hosts must be kept in mind during the consideration of this subject.

There is no exact standard for human tubercle bacilli, either in form, virulence, or cultural capacity, and the range in these characteristics shown by tubercle bacilli recovered from natural infections in cattle, birds, or cold-blooded animals differs from those recognized in the human type in degree only. It is a difficult matter to inoculate successfully a rabbit with some of the weaker of the human tubercle bacillus cultures, in spite of the great natural susceptibility of these animals to tuberculosis. At the other extreme, with every conceivable gradation intervening, may be found one of the human cultures that equals in virulence the most pathogenic of any that have been derived from cattle, and that assumes the form, regardless of its source, usually considered the type of the bovine bacillus. This wide range of characteristics in cultures of human tubercle bacilli is a potent argument for the unicity of all types of tubercle bacilli, as it is shown plainly that they may assume these varied characters even while subject to natural conditions.

It has been shown that bovine tubercle bacilli vary in form and virulence when obtained from different cattle, and we must conclude that the difference existing between the more virulent forms of the human bacillus and the majority of the bovine cultures are so slight as to be imperceptible and indescribable. There have been many cultures isolated from various human subjects by different investigators that have disclosed greater pathogenic activity than the bovine types

that have been grown in comparative cultures. In fact there seems to be a point where the two types meet, and this strengthens the supposition that whatever differences there may be between them are mainly due to differences in environment during the course of their development.

HISTORY OF ALLIED OBSERVATIONS.

It is somewhat self-evident that any series of observations having for its purpose the determination of positive change in any of the characteristics of a particular race of tubercle bacilli must be extended over a long period of time, because of the slow development of tubercular lesions and of artificial cultures.

The following principal methods have been used in the past in determining these changes:

(a) The passage of pure cultures of tubercle bacilli, whose characteristics have been carefully studied and recorded, through a series of animals unlike the original host, and the final comparison of the cultures thus obtained with the one first used.

(b) Observing the effects of continued growth for a period of many months under artificial conditions.

(c) The recovery from several tubercular animals of a single species of a number of cultures of tubercle bacilli which, while showing general uniformity of character, still present sufficient variety to prove that nature has by some unexplained means been producing a material transformation of these micro-organisms while perpetuating them within the bodies of animals of a single species.

(a) TRANSFORMATION THROUGH THE INOCULATION OF EXPERIMENT ANIMALS.

Among many reliable and valuable tests and observations attention is briefly called to the following extracts, which tend to prove that material transformation may be produced at will in cultures of tubercle bacilli by means of inoculations into animal hosts different from those in which they were originally found.

Nocard ²² a in 1898 made a series of valuable experiments, by which it was shown that the transformation of the tubercle bacilli derived from human subjects into others which conformed to the characteristics of the avian type was possible. By successively placing colodion sacs containing cultures of tubercle bacilli from human source within the peritoneal cavities of a series of fowls he succeeded in so modifying the pathogenic properties of the culture used that it finally proved virulent to fowls by direct inoculation, although previous to its modification it possessed no pathogenic properties when injected into fowls in like quantities and under similar conditions.

^aThe reference figures refer to bibliography at end of article.

This was one of the first investigations ever made in this direction, possibly the very first, but the results obtained have gone far to prove the unicity of species of the various tubercle bacilli, as well as the possibility of their being changed in character under certain conditions.

Nocard also obtained from sputum some tubercle bacilli that were identical with bacilli of the avian type. He succeeded in killing a number of fowls by inoculating them with these tubercle bacilli, and the lesions produced were similar to those found in spontaneous tuberculosis in fowls. He recognized in this instance a profound modification in the virulence of these avian tubercle bacilli by their passage through the human organism.

Pearson ³³ (1900) states—

As to the morphology, I would say that this can be changed materially by passing through a single animal. For example, if a culture of short, thick bacilli from the cow is used for inoculating the pig or the goat, the bacilli recovered after the death of the inoculated animal are in some instances longer and more slender.

According to a report made by Delépine ⁷ (1901), this writer has been able, by the use of a combination of tuberculous sputa from various sources, to produce in the calf true tuberculosis from human tubercle bacilli, and from the lesions thus produced he obtained cultures of tubercle bacilli which displayed an increased degree of virulence. He has found remarkable variations in the virulence of tubercle bacilli derived from different human sources.

Hamilton ¹⁰ (1902) states that while many experimenters have been able to produce local lesions in a calf, several of them have found that a reinoculation from the point of inoculation will produce generalized tuberculosis in the second calf, thus showing that the pathogenic properties of the human tubercle bacillus had received material accentuation by a single passage through a member of the bovine family.

Dean and Todd ⁶ in 1903 report that—

The microscopical examination of the sputa from different cases showed that in certain of these fairly definite special morphological characteristics of the bacilli could be determined. In one particular sputum the predominant form of the bacillus was very long and beaded, whereas in others a type of medium length seemed to be most frequent.

With the view of ascertaining whether these types persisted in cultures, and in the tissues of the experimental animals, very numerous microscopical examinations were made, but neither in the culture nor the animal body could this persistence be demonstrated. For example, in preparations from cultures of the very long beaded bacillus referred to, in one field of the microscope short, medium, and long bacilli were present. Nor in the experimental animals could we find that there was a uniform tendency for the bacillus to approximate to any one particular type.

In the following experiments by Römer ²⁸ (1903) the material used was obtained from cultures grown by Von Behring in his laboratory, and it comprised various types of tubercle bacilli which originated in man, cattle, or fowls.

His "culture No. 2" was obtained by passing a very nonvirulent type of human tubercle bacilli, which had been grown artificially for many years, through a goat, after which passage it was found to have developed properties which made it virulent for cattle and sheep, even proving fatal for some of the cattle which were inoculated with it. The increased virulence of this culture must have been caused by its stay in the body of an animal which is relatively resistant to tuberculosis and by the transformation which resulted from its adaptation to an unusual environment.

After its recovery from the goat this culture showed marked cultural and morphological differences from the one originally used, in that its individuals were smaller and its growth upon favorable media was more tardy and scanty. In fact, it approached in both of these particulars very closely to the cultures of bovine origin.

Doctor Römer states that bovine tubercle bacilli usually evidenced greater pathogenic powers than those possessed by cultures of tubercle bacilli of human origin, but this relation was not constant, as some cultures of the organism which were derived from cattle possessed very slight pathogenic properties, while certain cultures derived from human subjects disclosed remarkable pathogenicity for all kinds of laboratory animals.

The successful elevation of one type of human tubercle bacillus by means of its passage through a goat by inoculation methods lends force to the supposition that such accentuation may occasionally occur naturally.

This author also reports the transformation of avian tubercle bacilli obtained from fowls by rapid passage through guinea pigs and rabbits intraperitoneally to such an extent that they would at last cause the development of tubercular lesions similar to those caused by mammalian tubercle bacilli. Furthermore, having noticed that many cultures of tubercle bacilli would multiply with remarkable rapidity if injected into the body of a white mouse, Römer made practical use of the fact by passing through these animals cultures which were making unsatisfactory growth upon artificial media, and by this means was able to gain a luxuriant growth upon his media after their final recovery from the white mouse.

Moeller ²⁹ (1903) finds that human tubercle bacilli acquire an added virulence for guinea pigs when submitted to a single passage through one of these animals, as compared with tubercle bacilli taken directly from the human organism. He has found that the bacilli having once

passed through the animals adapt themselves to that soil, and henceforth become more virulent; hence after the passage of the bacilli through the guinea pig we are no longer dealing with human tubercle bacilli, but with a type of tubercle bacilli peculiar to guinea pigs.

Krompecher and Zimmermann ²⁶ (1903) claim that no experiments with tubercle bacilli from any source should be given credence unless material obtained directly from an infected subject of the type under consideration is used in the investigations, because even a single passage of the human tubercle bacillus through a laboratory animal will produce so material a modification of the organism that its primal characteristics can no longer be determined.

Sciallero ²⁹ (1904), of Maragliano's laboratory, immunized animals with tuberculin and observed the morphological changes which took place in tubercle bacilli that had been inoculated into the same subjects of experiment. He found that the bacillus assumed in these animals a number of aberrant and degenerate morphological types. Some of these were thinner and some were shorter than the typical bacillus of tuberculosis, while others did not take the fuchsin stain readily or evenly. When the same bacilli were injected into non-immunized animals they showed but few altered forms. The author thinks that the appearance of the morphologically distorted or degenerated forms of tubercle bacilli in predominant numbers in the sputum of patients with tuberculosis should be regarded as a favorable sign.

In an instructive article by Dinwiddie ¹⁰ (1902) we read the following:

In the rabbit and guinea pig inoculated with bovine cultures exhibiting the short form the results have been variable. I have slides in my collection in which the short type of bacilli can be recognized in smear preparations from these animals, while in others longer and medium forms predominate.

This writer may be further quoted as follows ⁹ (1900):

Briefly, it has been found by these comparative inoculations that the bovine germ is more virulent. For some species of animals it has proven very much more virulent, and for other species the excess of virulence is less, but always distinct. It has also been found that the shape of the bovine germ can be changed very much by passing it through the pig. For example, a pig was inoculated into the lungs with a short, rather broad bovine germ. It died of pulmonary tuberculosis, and the tubercle bacilli that were recovered from the pig's lungs were of a long, slender, granular form. It was found to continue so in culture and in inoculations.

Wiener ⁴⁶ (1903) obtained a culture of tubercle bacilli ("type humanine") from a horse, which proved to be especially virulent for fowls. Retention of these tubercle bacilli, by means of collodion sacs, for seventy-five to eighty-five days within the bodies of fowls gave to the bacilli more of the character of avian tubercle bacilli.

Karlinski ³² (1904) shows that a culture of tubercle bacilli derived

from human sputum will increase in virulence to such an extent by single passage through the organism of a goat that it will produce as great lesions in a few weeks in a calf as would be produced by human tubercle bacilli, as commonly used, in five or six months.

The inoculation of a healthy goat with 0.1 gram avian tubercle bacilli caused the animal to react to the tuberculin test in four months. Post-mortem examination showed enlargement and caseation of the tracheal glands, together with collections of tubercular growths upon the diaphragm and upon the surface of the spleen. Cultures taken from these growths in the goat grew readily and were capable of producing generalized tuberculosis in guinea pigs, although no results followed the use of the same organisms in similar manner and amount previous to their passage through the goat.

In another article Karlinski ²¹ (1904) reports that sputum tubercle bacilli had been increased in virulence by rapid passage through guinea pigs or cattle until at last they would produce generalized tuberculosis in cattle and when recovered show no marked differences from bovine tubercle bacilli. Neither would the lesions produced by them in cattle differ in any respect from those developed by inoculations of bovine tubercle bacilli.

The report rendered by the German Tuberculosis Commission contains much that is of unusual interest, and it should receive the most careful consideration, coming as it does from a company of men who were appointed upon Koch's recommendation, who were fully conversant with his methods, and, furthermore, would naturally be inclined to favor his views so far as possible.

After giving an outline of the experiments which the commission made, Kossel, Weber, and Heuss ²⁵ (1904) give expression, among others, to the following deductions:

It was shown by these experiments that animals generally died sooner as the result of inoculation with "perlsucht" material than they did when inoculated in a similar manner with material derived from human sources.

There were even greater differences shown between bovine and human tubercle bacilli when their cultural characteristics were considered. The latter developed a thrifty growth much more readily than the bovine type. The serum tubes which were inoculated with human tubercle bacilli showed numerous colonies as a rule in from ten to twenty days. The bovine material was much slower in producing a growth and the colonies were often few and scattering. The amount of material to be obtained from the bovine culture tubes was always less than in the case of human cultures, so that it was often difficult to obtain a sufficient amount of bacilli to serve for the inoculation uses. These differences gradually disappeared, however, when the cultures were grown upon artificial media for a longer time.

In a previous report by Kossel ²⁴ (1903) we read the following:

It also appears possible, however, that the bacilli of human tuberculosis may under certain conditions attain a very marked pathogenic character for cattle without themselves being "perlsucht" bacilli.

Here is a frank admission that the type of tubercle bacilli which the German Tuberculosis Commission considers totally different from that found in cattle will readily submit to modification if its surrounding conditions are made right, and with this admission of theirs fresh in mind it is interesting to read their report of the inoculations of cattle Nos. 33, 75, and 76 with tubercle bacilli obtained from the sputum of a human adult.²⁵ Previous to their use in the experimental work of the commission these cattle were all subjected to the tuberculin test without reaction. No. 33 was first inoculated with 5 cc. of the sputum culture subcutaneously. Slaughtered one hundred and twenty-five days later, it was found on post-mortem examination that the point of inoculation supported a tubercular tumor from which the disease had extended to the adjoining pre-scapular lymph gland. On the opposite side of the neck the prepectoral glands were affected. Further than this the anterior mediastinal gland and the left bronchial gland supported tubercular foci, while the right middle lobe and the upper and lower lobes of both lungs contained miliary tubercles with visible yellowish centers. None of the foci found in the lymph glands gave any evidence of calcification.

Surprised at this unexpected evidence of virulence in a sputum culture, they decided to repeat the test, and cattle Nos. 75 and 76 were used for this purpose. No. 75 was inoculated, similarly to the inoculation of No. 33, with the sputum culture, which had, however, grown upon artificial media for seven months by the time that it was now used, and No. 76 was inoculated subcutaneously with a culture from the bronchial gland of No. 33. No. 75 was slaughtered one hundred and thirty-five days after inoculation, and it was then found that the point of inoculation supported two tubercular abscesses and that the infection had extended to the adjoining lymph gland. Considering the age of the culture used, this result seems to verify that obtained from cow No. 33, proving that this sputum culture possessed considerable virulence for cattle. The effect of passing this sputum culture through the body of No. 33 was shown by its action upon No. 76. This animal died of generalized tuberculosis fifty-one days after its inoculation. The affected tissues gave evidence of an inflammatory tubercular infection in which scattered caseous foci were present. Here also no calcification was noted.

Ravenel²⁷ (1902), in an experiment instituted by Pearson, succeeded in materially increasing the virulence of sputum bacilli by repeated passage through calves. He started with a culture of moderate virulence, which caused the death of the first experiment calf of the series in one hundred and six days. The second calf of the series died in forty-eight days after the inoculation, the third on the twenty-third day, and, finally, the fourth and fifth succumbed on the twenty-

fourth day, thus demonstrating a great increase in virulence in this sputum culture by continued passage through animals of the bovine race.

Mohler and Washburn²¹ (1906) mention some interesting experiments which were made with the BB culture of Ravenel. In their article the following appears:

The bacilli used in the initial test of culture BB upon cattle consisted of a twenty-six days' growth on dog serum, and had had a total growth under artificial conditions of about sixteen months. The fourteenth generation was the only one available, and although the culture evinced considerable pathogenicity for the bovine race when used in pure culture, it is possible that its continuous artificial cultivation had lessened this virulence somewhat. This conclusion seems justifiable when the results here obtained are compared with those gained by Ravenel a year previously. At each point of inoculation (in heifer No. 266) a firm tumor gradually developed, which ruptured spontaneously about three months after the inoculations were made. These continued to discharge more or less freely up to the time of slaughtering the animal. The material cast off had the appearance of thick, creamy pus, in which many fragments of caseous debris were mixed. Post-mortem examination one hundred and seventy-eight days after the injection disclosed open ulcers at each point of inoculation. The prescapular glands were badly tuberculous. On sectioning the swollen glands they were found to be filled with thick, creamy pus and broken-down glandular tissue. The retropharyngeal lymph glands showed several tubercular foci, and in the surrounding tissues many yellowish tubercular areas were noted. There was no extension to either the thoracic or the abdominal cavity.

A second heifer—No. 258—was at once inoculated with an emulsion of one of the prescapular glands of No. 266. The resulting lesions were very similar to those found in No. 266 in their extent, but instead of the moist, creamy pus which filled each tubercular area, dense calcareous deposits were present. There was, moreover, an extension into the peritoneal cavity, where a scattering of small tubercular growths was found attached to the capsule of the spleen.

In order to test the effect of rapid passage through cats upon the BB tubercle bacilli, the third heifer—No. 297—was inoculated with an emulsion of omentum from cat No. 43, the fifth cat in the series. The resulting disease was marked by its rapid onslaught and wide extension. There was an elevation of temperature of 2° F. within a few days, and then a period of comparative regularity at points varying between 102.8° and 104° F. After this, up to the time of the death of the animal, the temperature was regularly high, flesh and strength were lost rapidly, and a persistent cough was present. At the post-mortem examination firm tumors, with caseo-calcareous contents, were noted at the seats of inoculation. The prescapular glands were of the size of a man's fist and contained many areas of tuberculous degeneration. On viewing the thoracic cavity the visceral and parietal pleuræ were found to be firmly adherent. In like manner, where the various lobes of the lung came in contact with each other, the adjacent surfaces of the visceral pleura had become almost completely fused by a fibrous, connective tissue growth, which could only be separated by the application of force. Scattered here and there over the external surface of the pericardium were small masses of nodules, each mass containing from 5 to 12, while a chain of similar nodules extended over the entire length of the organ from base to apex along the right side. The bronchial and mediastinal glands appeared badly affected throughout. The lungs were nearly filled with tubercular nodules 2 or 3 mm. across. These nodules were more numerous in the anterior

portion of the lung, where the tubercular tissue was more plentiful than the normal lung substance. The organisms had also invaded the abdominal cavity, and the parenchyma of both liver and kidneys were thickly sown with nodules varying from 1 to 5 mm. in size. A few similar nodules were present in the spleen, and the mesenteric glands also showed wholesale invasion.

Carried to the second animal—No. 318—of this series the resulting disease was less acute, but was still of a very active type and caused pronounced elevation of temperature, with rapid emaciation of the animal. The post-mortem examination, held ninety-seven days after injection, showed walnut-sized areas of tuberculosis at the seats of inoculation, with marked involvement of the adjacent prescapular lymph glands and dissemination to the thoracic cavity, where the mediastinal glands and lung tissue presented numerous small caseous foci of disease.

The effect of rapid passage through cats inoculated intrathoracically is here shown to be an increase of virulence to the bacilli so treated. Similar results were also obtained with Mohler and Washburn's culture, designated Sputum C.

It has been shown by Dieudonné⁸ (1903) that the repeated passage of mammalian tubercle bacilli through frogs will gradually give to the micro-organisms added virulence for cold-blooded animals and greater likeness morphologically to the type of tubercle bacilli usually recovered from fishes or frogs.

Recovered from the last frogs of the series and grown artificially, it was seen that they preferred a low temperature and would not grow at a higher temperature than 30° C. The cultures had the naked-eye appearance of piscine tubercle bacilli. They had, moreover, entirely lost their pathogenicity for guinea pigs.

Theobald Smith⁴¹ (1903) found that tubercle bacilli obtained from a cat naturally infected, as seen in smears from the lung tissue, were few in number. They appeared in groups of very slender rods, staining very feebly, and were only to be recognized with difficulty. After a single passage through a guinea pig they immediately assumed the bovine form, becoming quite short and thick. The cultures developed slowly and grew feebly for a number of transfers. On dog serum the growth had for a time a smooth, translucent appearance somewhat like that of the avian race.

In the investigation of tubercle bacilli from cold-blooded animals Küster²⁷ (1905) examined some 200 frogs and 50 other related animals. Out of these he found 3 that harbored acid-proof bacilli that were similar in every particular to the bacilli described by other writers as the cause of tuberculosis in cold-blooded animals. It was found that they would grow readily in pure culture upon all of the media commonly used in the propagation of tubercle bacilli. The cultures developed upon serum or glycerin-potato gave a naked-eye appearance quite similar to check cultures of avian tubercle bacilli, while cultures grown upon glycerin-agar presented the dry, and even

scaly, appearance so typical of human tubercle bacilli. Rabbits inoculated intra-abdominally with pure cultures of the frog baccilli showed, at autopsy six weeks later, the formation within the abdominal cavity, especially upon the mesentery, of tubercular growths which were very similar to those seen in real mammalian tuberculosis, and within these lesions acid-proof bacilli were readily demonstrated which were identical in every way with the frog tubercle bacilli injected. Inoculations of rabbits through the ear vein produced lesions similar to those following the injection of mammalian tubercle bacilli under like conditions. White rats also proved to be susceptible to the frog tubercle bacilli, dying in eighteen days after inoculation, with the formation of numerous tubercles upon omentum and spleen. The baccilli were present in these tubercles in great numbers and were readily recovered upon artificial media, thus proving their retention of vitality for eighteen days within the organism of the white rat.

The British Royal Commission¹⁴ (1907) tested sixty cultures of human tubercle bacilli. Of these fourteen—three from cervical gland tuberculosis and eleven from primary abdominal tuberculosis—rapidly produced generalized tuberculosis when injected into cattle. Four others, which at first caused only local lesions, became accentuated in virulence by further inoculation into cattle until they would readily produce generalized tuberculosis and equaled the virulence of bovine tubercle bacilli.

Arloing¹ (1905) reached the conclusion after a long series of experiments that tubercle bacilli recovered from cases of human tuberculosis may represent different degrees of virulence. Those of one extreme readily produce generalized tuberculosis in both guinea pigs and rabbits. Those of the other extreme, greatly attenuated, scarcely affect the guinea pig, and are harmless to the rabbit when first recovered from the human tissues, but if they are passed through two or three guinea pigs they will acquire by this means sufficient virulence to cause tuberculosis in the rabbit.

Recent investigations by De Jong²⁰ (1905) have shown very conclusively that human tubercle bacilli are susceptible to increase of virulence if passed through the proper animals. He used a culture which at first possessed so slight a degree of virulence that intravenous injections of two cattle, one a 2-year-old heifer and the other a 2½-month-old calf, resulted only in transient lesions that were apparently healed over by the time that the autopsy was held. This culture was then injected into a goat, proving fatal after a lapse of over three years. During its long retention in the organism of this goat, the bacillus acquired a marked accentuation of virulence. Used after this passage, in small amounts under the greatest protective precautions, it was found possible to cause fatal generalized cases of tubercu-

losis in calves through subcutaneous inoculations, and the picture presented at the post-mortem examination was identical with the picture resulting from inoculations with tubercle bacilli of bovine origin. From these results De Jong draws the following conclusions:

That there is no real marked difference in variety existing between human and bovine tubercle bacilli; and further, that a culture of weakly virulent human tubercle bacilli may be brought up in virulence by means of animal passage until it gains the virulence usually possessed by bovine tubercle bacilli.

By the use of human tubercle bacilli Herzog¹⁷ (1903) has produced tuberculosis in fishes, and has found that in the process the virulence of these germs was diminished, and that they were brought by this passage closer to the bacilli of cold-blooded animals so far as preference of temperature was concerned. In a later test he proved that similar transformation could be caused in bovine tubercle bacilli by the introduction of these micro-organisms into cold-blooded animals in like manner, from which results he reasons that human and bovine tubercle bacilli are at least closely allied. The above investigations show that the bacillus of mammalian tuberculosis requires a certain time when injected into cold-blooded animals in which to become so fitted to its new surroundings that it can exert its usual deleterious influence. This time varies according to the individual differences of the culture used. The lesions produced in frogs by mammalian tubercle bacilli are both macroscopically and microscopically of equal importance with those produced by fish tuberculosis.

Klimmer²⁸ (1905), in order to form a definite decision in regard to the possibility of a transformation of tubercle bacilli through animal passage, carried through a long series of experiments upon cold-blooded animals. The results obtained by his series of experiments with carp showed conclusively that tubercle bacilli submitted to passage through cold-blooded organisms gradually develop a reduction in their virulence, as shown by test inoculations upon guinea pigs, when the incubation period and the duration of the disease, together with the pathologic lesions, indicate unmistakably a weakening of the virulence of the bacilli. A similar result was obtained by the use of salamanders brought from Corinth. Here the tubercle bacilli lost their virulence for mammals completely. These nonvirulent tubercle bacilli were then used in immunizing experiments upon cattle. Culturally they gave the appearance of being human tubercle bacilli. They had lost the smeary character of growth of tubercle bacilli from cold-blooded animals and grew in dry, brittle, dirty-white masses. Their development was rapid, and they showed a preference for a temperature of about 30° C., although they grew well at room temperature. They proved to be nonpatho-

genic for mice, guinea pigs, rabbits, rats, dogs, sheep, goats, cattle, and horses. From these facts the conclusion may reasonably be drawn that they were also nonvirulent for man.

By reason of the results obtained from a series of experiments, Hamilton and Young¹⁵ (1903) have reached the following conclusions:

Although tubercle bacilli of human origin are probably less virulent for calves than those of bovine origin, the same can successfully be transmitted to cattle. The transmission succeeds equally well when tuberculous glands, sputum, lung tissue, or urine are used as inoculation material. The transmission may be accomplished through the inhalation, the subcutaneous inoculation, or the intravenous injection of the infectious material. The organs situated nearest to the point of inoculation become the most severely affected. The lymphatic system was always affected.

The feeding of tubercular sputum may produce tuberculosis of the abdominal lymphatic glands without necessarily affecting the intestinal canal.

The virulence of human tuberculosis can be enormously increased by the inoculation of a second calf from one primarily infected with material from the human subject. The morphological character of the bacilli is not constant, and is not a satisfactory indicator of the origin of any particular culture.

These experiments warrant the conclusion that human and bovine tubercle organisms are identical, although they differ in the degree of their virulence.

(b) TRANSFORMATION BY MEANS OF ARTIFICIAL CULTIVATION.

The modification which is most perceptible in tubercle bacilli as a result of their passage through animal bodies is an alteration, either an accentuation or an attenuation, of virulence, with altered morphology somewhat less in evidence. Continued growth for generation after generation upon artificial culture media results, on the other hand, almost without exception in a reduction in virulence, a more luxuriant growth, and a tendency toward an increased length, with possible branching of individual bacilli, together with variable staining capacities.

The extracts which follow have been made from the writings of bacteriologists of note, and the conclusions reached by them should be given careful consideration.

Dubard¹¹ as early as 1898 had made tests of the changeability of the tubercle bacillus and reported as follows:

Our attempts have all tended to show that the tubercle bacillus is more malleable by outside influences than most investigators have been wont to believe. We have been able to modify its form, its manner of growth upon artificial media, its staining properties, and its pathogenic powers.

Grown in ordinary bouillon, we have found that after the third or fourth generation the human tubercle bacillus will present luxuriant growth, but microscopically will be greatly altered from the original organism.

Vagedes⁴³ (1898) noted the following cultural alterations:

The form of the tubercle bacillus when first observed in pure culture was considerably shorter than the same bacilli showed when derived directly from the

affected tissues, and the older cultures repeatedly showed a greater number of long forms than young cultures of the same generation would exhibit.

We quote as follows from Hueppe ¹⁸ (1901) :

Koch once more draws all the fallacious inferences which arise from regarding an inoculated disease as a natural infection, and yet these things have little to do with one another, as we know from a laborious work of forty years. "The tubercle bacillus of man has no hold on the ox, consequently the tubercle bacillus of man and the ox are different species." It is the same fallacious inference as Mafuccé and Koch arrived at in connection with the difference of bacteria of mammalian and avian tuberculosis. These bacteria really show in their cultures distinct differences such as are not found in bacilli of different species occurring in mammals. Nevertheless they belong to one species as obvious modifications dependent on differences of nutrition and situation. F. Feschel and myself have by purely cultural methods changed the one modification into the other and have so altered them that mammalian tuberculosis took effect in fowls and the bacilli of avian tuberculosis took effect on mammals.

Marmorek ²⁸ (1900) found a marked difference between young tubercle bacilli and older individuals of the same culture. This was manifested by the refusal of the young tubercle bacilli to retain the fuchsin stain when treated by the method of Ziehl-Kuehne, and also by the absence of cohesion among themselves, by means of which the individual bacilli were usually found singly and never in clumps. These results were obtained by examining tubercle bacilli grown upon liquid media or upon potato.

Gilruth ¹³ (1902-3) mentions piscine varieties of tubercle bacilli which had peculiar characteristics, the chief being that they grew best at low temperatures and could not bear those of blood heat. Cultures were not pathogenic for rabbits, birds, or guinea pigs, but were virulent for all cold-blooded animals on which they were tried, such as carp, frogs, tortoises, lizards, snakes, etc. That it was only a variety of the parent stock was proved by the fact that gradual increase of the temperature for succeeding subcultures resulted in cultures that grew readily at blood heat; and successive passages through guinea pigs and rabbits ultimately succeeded in raising its virulence so that it became fatal for these animals.

An article by Lawrason Brown ³ (1903) presents points of unusual interest, as it shows the great variation of morphology of tubercle bacilli which follows the application of certain lines of treatment to human tubercular patients, and also in showing that the age of the bacillus has much to do with its length. One hundred and fifty cases were observed. Beading was found uniformly present in all classes of cases. Length of the bacilli was seen to vary somewhat with the results of treatment. There were fewer long and short bacilli and more of medium length in cases apparently cured, while the number of long and short bacilli was greater in the arrested and improving cases, and most of all in the cases that failed to

respond to the treatment, but these differences were not marked. He also mentions a culture of tubercle bacilli that presented in old growths a predominance of long beaded forms with knobs and irregularities. Some were short. In younger growths of this culture short and medium forms occurred with greater frequency, and they were less beaded. Another culture obtained from an acute case proved uncommonly virulent. Old growths of this culture showed chiefly long and beaded forms, while young cultures were found to be composed very largely of short forms, although some long forms with swollen extremities were present.

From these observations it was concluded that virulent and attenuated forms of tubercle bacilli possess practically the same morphology, and that short bacilli represent usually a younger stage of development. The predominance of short bacilli should be looked upon as indicative of a very active process of advancement in the disease process.

The morphological variability of the bovine tubercle bacillus when grown upon artificial media has been referred to as follows by Dinwiddie¹⁰ (1902):

On the medium which I have usually employed—glycerinized beef serum—although the short form usually predominates, the distinction between these and cultures from the human is not always applicable. Bovine cultures are more difficult to start and generally make a feeblar growth than human. The naked-eye appearances depend chiefly, I think, on the scantiness or luxuriance of the cultures. On Löffler's medium I have noticed that the human germ assumes the form of the bovine.

An explanation of the conditions on which this variability depends is not possible with our present knowledge. It is manifest, however, that the source of the bacilli in the sputum of the human consumptive—human or bovine—is not to be determined by their morphology.

McBryde²⁹ (1903) has shown that the addition of paraffin to egg-culture media caused an increase in the length of bovine tubercle bacilli grown upon such media from 2 μ to 8 μ in seventeen weeks. The bacilli grown in contact with paraffin all showed beading, and there was here noted a luxuriant growth of the cultures, which even piled up along the edges of the paraffin and finally completely covered it over.

Wolbach and Ernst⁴⁷ (1903) have mentioned the possibility of obtaining long, filamentous forms of bovine tubercle bacilli, staining irregularly, as a result of growing them upon brain media. Various other deviations from the morphology usually considered characteristic of the bovine type were noted as results from growth upon test media, but the most marked changes occurred during growth upon brain media, the length of the bacilli in some instances showing fourfold multiplication.

In relation to the transformation of the tubercle bacilli through artificial growth, Prettner³⁴ (1903) has found that any variety of tubercle bacillus may be rapidly attenuated by the addition of glycerin to the culture medium, and that this attenuation will be manifested in the generation next following the treatment of the medium. Potato glycerin proved an excellent medium for supporting the growth of tubercle bacilli, as they multiplied readily upon it, but in a few generations they became attenuated to such a degree that they were innocuous.

One of the most indefatigable workers upon the question of the mutability of the tubercle bacillus is Professor Arloing,² of Lyon. The following has been gleaned from his report (1903) of the production, by cultural methods, of homogeneous growths of tubercle bacilli which are comprised of individuals which represent the morphological extremes and all of the varied intermediate forms:

The fundamental characters of the cultures of tubercle bacilli are shown by their vegetation upon liquid or solid media in contact with air. Upon solid media the colonies are dry, projecting, and wartlike; upon liquid media the growth appears as a thin veil, which slowly thickens and develops into folds and wrinkles.

If one cultivates tubercle bacilli of either human or animal origin for a long time upon solid glycerinized media, it will be found upon later comparison that they have changed considerably from their normal appearance; and moreover—to this point we wish particularly to call attention—these aspects may change from generation to generation, and gain in time the classic form.

Here, for example, is a culture of equine tuberculosis, which when grown upon glycerin-potato acquires a gray, blue-like, homogeneous appearance; and now if this be reinoculated upon potato it produces a growth, first uniform, and then covered with ridges, dry and warty; another culture of the same bacillus, instead of giving growth like this, with a new generation may produce even a more moist growth, or again one more dry.

Here again are our cultures of avian tuberculosis, which have absolutely the appearance of cultures of mammalian tuberculosis, and vice versa.

The most profound transformation that Arloing has ever witnessed was obtained by growing cultures upon bouillon to which had been added 6 per cent of glycerin. Carrying to this medium a colony of the human bacillus, dry and verrucose, there was obtained as a result of its growth here a colony as moist and oily in appearance as those grown upon glycerin-potato; furthermore, the culture was acclimated to growth in the depths of the liquid, where it caused a cloudy homogeneous appearance, and instead of grouping together in clumps, as is their wont, the bacilli were found isolated.

The same profound change in character of growth was obtained in growing the bovine type of tubercle bacillus.

If one transfers these homogeneous cultures to potato they will be found to return slowly and gradually to the production of dry.

prominent colonies. Sometimes this change is accomplished during the growth of a single generation.

The microscopic morphological characters of the bacilli are not less important.

The writers who have previously described the morphological characteristics of tubercle bacilli have not given in their descriptions the distinctness which a precise, constant morphology requires. Upon comparing bacilli of bovine origin from a solid medium with those of homogeneous cultures from glycerin-bouillon, one is struck by the number of differences present. A preparation derived from bovine bacilli grown upon the usual culture media will show generally short bacilli, somewhat stubby. A preparation derived from a homogeneous culture of the same bacilli will show, among some short individuals, others that are very long and of the regular diameter, sometimes showing marked expansion at one extremity, and again arranged as pseudo-branched forms. They will, however, readily separate. A great number of protoplasmic masses present to staining and decolorization all of the characteristics of the bacillus of Koch.

If these homogeneous cultures are again grown upon potato they will gradually return to more uniform and classical morphological characters and staining affinities.

Friedmann¹² (1903) has recovered from the turtle a culture of tubercle bacilli which shows culturally great similarity to the human type. After growing to the third generation upon glycerin-gelatin at a temperature of 37° C. and being transferred to glycerin-agar the resulting growth could not be differentiated in any particular from that of human tubercle bacilli and showed none of the characteristics usually present in growths of tubercle bacilli from cold-blooded animals.

Steriopulo⁴² (1903) after a careful examination of numerous publications on the subject has reached the conclusion that differing tubercle bacilli and so-called pseudo-tubercle bacilli appear as varieties of one and the same species. Each separate variety of this bacillar species possesses characteristics which are peculiar to that particular variety, and when grown under natural conditions these peculiar characteristics are found to be constant. Through experimental measures, however, these characteristics may become changed and in this way any particular type may become merged into some of the other varieties.

According to Carini⁴ (1904) tubercle bacilli in lymph become affected by the action of glycerin the same as other bacteria with which they may be associated. They become weakened in their virulence until they finally die. Their loss of virulence shows itself in

the longer time required for a certain amount of culture to produce death after it has been subjected to the action of glycerin in comparison with those cases in which fresh material is used.

Ravenel ³⁶ (1901) in his London address stated:

This culture (bovine F) was isolated with some difficulty, and so scant was the growth for six generations that I was several times on the point of abandoning it. Only in the sixth generation was growth enough obtained for experimental inoculation. Considerable more growth took place in the seventh, and the eighth grew luxuriantly, since which all subcultures have been abundant. From the eighth generation on, serum cultures were made on 5 per cent glycerin-agar and an abundant growth obtained on this medium in the first transfer.

Coincident with this increase of vegetative power came a marked change in morphology. From being short, thick, and staining evenly, it is now long, more slender than in the early growths, and shows marked beading. In other words, from being a typical bovine culture, it has during the past ten months so changed that it can now pass as a typical human culture. It will be observed that its pathogenic power for guinea pigs and rabbits was not as great as is usually found in bovine cultures.

(c) TRANSFORMATION UNDER NATURAL CONDITIONS.

It has been shown that when one begins the task of recovering cultures from tubercular lesions in man or animals there is considerable uncertainty as to the type of tubercle bacilli which will be encountered. Avian types have been recovered from man and from horses, cattle, and many of the smaller animals, while conversely mammalian types have been found in birds. Perhaps the most striking instances of irregular infection are those related by Weber ⁴⁴ (1904) before a gathering of physicians in Berlin, with reference to the findings of the governmental commission appointed to study tuberculosis, to whose membership the speaker belonged.

During the investigations of the commission tubercle bacilli were recovered from the human body in six cases which were recognized as those of the bovine type. In these six instances the disease may have arisen from the consumption by young children of infected cows' milk, or there may have been a double infection with the simultaneous appearance of human and bovine tuberculosis in one and the same body.

Crookshank ⁵ (1896) in his text-book on Bacteriology and Infective Diseases writes:

The bacilli in tissue sections of bovine tuberculosis are shorter and less granular than those in human tubercular sputum, but in milk they are quite as long, and even longer, and very distinctly granular or beaded, and are thus brought much closer, morphologically, to the bacilli in human sputum.

Neither length nor granularity is a characteristic sufficient to denote any specific difference between human and bovine bacilli. The author has examined minutely the bacilli in tuberculosis of other animals, such as the horse, pig, and cat; and of birds—the fowl, guinea fowl, pheasant, and ostrich. Here again

minute morphological differences can be observed. For example, in many cases in fowls the bacilli are conspicuously short and straight. In the liver and lungs of an ostrich packets of short rod forms are found, while in other parts of the same sections the bacilli attain a very great length.

Thus morphological differences are found under different circumstances, and within limits the morphology of the tubercle bacillus varies with its environment.

In an early report of a peculiar case of tuberculosis in a cow Johne and Frothingham¹⁹ (1895) enumerate several conditions which led them to believe that they had to do with an infection of a bovine by natural reception of avian tubercle bacilli. The recovered bacilli offered marked deviations from the bovine type of tubercle bacilli, not only morphologically, but in their biological and pathogenic properties as well. They would not produce tuberculosis in guinea pigs although injected in large amounts, which is characteristic of the avian type. The lesions developed in the cow were not typical of bovine tuberculosis, but approached very closely those caused by avian tubercle bacilli.

Rabinowitsch²⁵ (1904) expresses the opinion that the bacilli of avian and mammalian tuberculosis are not separate species, but are only varieties of a single species which have assumed varying characteristics through sojourn in suitable hosts. Changed relations between these two varieties occur frequently in the animal world. Avian tuberculosis has been known to occur spontaneously in mammals, and mammalian tuberculosis has been frequently observed in parrots and birds of prey.

In her own investigations Rabinowitsch found that infection of birds usually occurred through contact with contaminated feces or through devouring rats or mice affected with avian tuberculosis. This form of tuberculosis may therefore be found among mammals, and, on the other hand, a number of birds were found that had died of mammalian tuberculosis. The cultural and pathogenic properties of the separate varieties are different, but transitional forms may be observed, and Rabinowitsch believes that they are all only varieties of a single species and that reciprocal infections between birds and mammals take place oftener than is commonly supposed.

At a time when "types" of tubercle bacilli were almost unknown, Theobald Smith⁴⁰ (1895-96) used the following in the introduction of an article which first directed attention to variations in form and virulence among the micro-organisms:

W. Kruse gives the history of four cultures—one from Pansini (Naples), isolated from tuberculous sputum after having been passed through a guinea pig; one from Armanni, isolated in the same manner; one from Sanfelice, isolated from tubercles in the lungs of cattle, and one from Straus, of Paris, the origin of which seems to be not positively known. These four cultures failed to produce more than a local disease in guinea pigs. In two out of twelve

rabbits military tuberculosis of the peritoneum was produced after intra-abdominal injection. Fowls were infected quite regularly by intraperitoneal injections. These cultures are therefore regarded by Kruse as belonging to the avian variety.

From a later work by the same author⁴¹ (1903), attention is called to differences in tubercle bacilli recovered from natural infections of cats with tuberculosis.

The two cultures from cats show some differences. The bacilli from Cat II were much more virulent than those from Cat III. Both approximated the bovine bacillus in morphology. The environment of Cat III suggests infection from man, but certain tests to be described later do not warrant this classification, but intimate a closer relation to the bovine bacillus.

In the special report of the German commission, relating to avian tuberculosis, Weber and Bofinger⁴² (1904) mention the identification of avian tubercle bacilli after their isolation from the caseated mesenteric gland of a 3-months-old pig. The animal showed no other tubercular lesions.

They also made the statement that avian tubercle bacilli as a rule showed morphological and cultural characters which distinguished them clearly from mammalian tubercle bacilli. Occasionally, however, they found cultures that appeared to be identical in these respects with the mammalian.

ORIGIN OF CULTURES USED.

From many tubercular cultures of various sources sixteen have been selected and submitted to a series of tests for the purpose of ascertaining if it were possible by these tests to cause any change in their form, virulence, or adaptability to artificial media.

Some of these cultures also furnished material for comparative study of tubercle bacilli as described in Bulletin No. 96 of this Bureau, and, as there stated, were isolated from their original sources in 1902.

The history of the cultures is given below:

1. *Culture Girl I.*—This material consisted of a caseous mesenteric lymph gland of a 6-year-old girl who died of generalized tuberculosis (numerous lesions being found in both the thoracic and abdominal cavities) at the Jefferson Medical College Hospital, in Philadelphia. It was impossible to obtain any history of this case, except that the child was of sound parentage. The tissue was furnished by Dr. Randle C. Rosenberger, bacteriologist to the hospital, to whom we hereby offer our sincere thanks for this, as well as for the material, history, and post-mortem notes of culture Case XIV.

2. *Culture Sputum C.*—The bacilli of this culture were isolated from the spleen of a guinea pig inoculated from the sputum of a young man 20 years of age, who was in the last stages of acute pulmonary tuberculosis. He was tall and athletic in build and had a negative family history. His health had been excellent until seven weeks prior to death, when he was attacked by la grippe,

which developed into pleuro-pneumonia. During the sixth week of illness tuberculosis was suspected, and a sample of sputum was brought to one of us for examination. Six days later death occurred from phthisis florida. No autopsy was made.

3. *Culture Boy V.*—The material used for this investigation consisted of the caseous mesenteric lymph gland of a 4-year-old boy who died of generalized tuberculosis. The family history was negative, the other children of the family being entirely healthy. The child developed anorexia, abdominal pains, diarrhea, and abdominal distention, together with a high fever. He had a slight cough, became very much emaciated, and died about six weeks after the development of the symptoms. This child was evidently affected with primary intestinal tuberculosis, as the foci in the lungs were very small and widely scattered and only involved the apices. The spleen and the liver, especially the latter, were likewise sprinkled with tubercular foci. The peritoneum, the omentum, and the mesentery contained many hemorrhagic tubercles, causing numerous adhesions between different portions of the intestines. Four or five ulcers were noticed in the intestinal tract, especially in the vicinity of the transverse colon. Many of the mesenteric lymph glands were swollen and more or less caseated. For this material and the post-mortem notes we extend our thanks to Dr. W. R. Brandenburg, formerly on the staff of Garfield Hospital, Washington, D. C.

4. *Culture Case XIV.*—The culture recovered for this study was obtained from a mesenteric gland of a 23 year-old man, a pauper, who died at the Philadelphia Hospital from generalized tuberculosis. It was impossible to obtain any previous history of this subject. The post-mortem examination showed the lungs to be permeated with numerous areas of tuberculosis, as were the bronchial and mediastinal lymph glands. The liver likewise showed a few isolated foci. The small intestines contained several tubercular ulcers elongated transversely to the axis of the intestines, these lesions being evidently secondary to the pulmonary lesions. Several nodes of the chain of the mesenteric lymph gland were enlarged and more or less caseated. One such gland formed the source of the emulsion used in the inoculation of a guinea pig, from whose spleen a pure culture on dog serum was obtained.

5. *Culture Bovine S.*—This culture was obtained from the lymph gland of a guinea pig which had been inoculated with a portion of a mesenteric gland of a cow condemned for generalized tuberculosis at a Philadelphia abattoir. On post-mortem examination the lungs were found to be studded with areas of tuberculosis varying in size from a hazelnut to a hen's egg, many of which had coalesced into larger clumps of affected tissue. The entire chain of mediastinal lymph glands were swollen and caseo-calcareous, while the bronchial glands were distinctly gritty, dry, and enlarged. The liver contained a few yellowish foci, while several mesenteric glands were swollen and cheesy. A few grape-like tubercles were found on the omentum and attached to the peritoneal side of the diaphragm. The carcass was poor in nutrition and was that of a cow about 10 years of age.

6. *Culture Hog O.*—This culture was recovered from the spleen of a guinea pig inoculated with a mesenteric lymph gland of a hog which was condemned on post-mortem examination at a Chicago abattoir for generalized tuberculosis. The cervical, bronchial, and many mesenteric lymph glands were tubercular. The lungs contained millary foci of tuberculosis. The liver and portal lymph gland showed foci of tuberculosis, while the spleen was enlarged to twice its normal size and contained numerous isolated areas of tuberculosis throughout

its parenchyma. The hog was about 1 year old and was received from the West, but whether it had been fattened on the product of the dairy or otherwise was impossible of determination.

7. *Culture Canine F.*—During the course of the regular pathological investigations pursued by the Bureau of Animal Industry it occasionally happens that the carcass of a dog that has succumbed to a natural infection of tuberculosis is received at the pathological laboratory for autopsy. From one of these cases, a native of the District of Columbia, pure cultures of tubercle bacilli were obtained and were grown upon serum. Drawings of these organisms of canine tuberculosis have been prepared, representing early and later growths (see Plate XVIII), and they are produced in this report merely for the sake of comparison, no general inoculation tests having been made with this variety.

Little or nothing is known of the previous history of the dog in question. When presented for autopsy the carcass was found to be in a condition of extreme emaciation. The primary lesion was apparently situated within the liver, as here were found three or four degenerated tubercular masses of the size of hens' eggs. They were in various stages of degeneration, both caseous and caseo-calcareous areas being present. The material within them was often of a peculiar claylike consistency, and varied in color from white to whitish yellow. Throughout the entire parenchyma of the organ, surrounding these large tumorlike masses, were to be found numerous miliary foci of tuberculosis. The omentum, the peritoneum, the pericardium, and both costal and diaphragmatic pleural membranes were thickly sown with minute tubercular growths. The kidneys were about equally affected, nodules being noticed near the surface, and on section the deeper portions were found to be similarly affected. The lungs were thickly studded with small shotlike tubercular growths. The mediastinal glands were enlarged and were the seat of caseo-calcareous degeneration. The spleen was unaffected.

8. *Culture Deer, European.*—This culture was recovered from tubercular lesions upon the pleura of a European deer which died at the National Zoological Park, Washington, D. C., of generalized tuberculosis. The tubercular involvement of all the tissues of the thoracic cavity, except the heart, was complete.

9. *Culture Deer, New Mexican.*—A small male English deer was received at the National Zoological Park from New Mexico only a few days before its death. Generalized tuberculosis was disclosed by the autopsy; lungs, pleura, thoracic glands, liver, kidneys, and mesenteric glands were all seriously involved. Cultures were obtained from the pulmonary lesions.

10. *Culture Deer, Sambur.*—This culture was isolated from the lung of a variety of deer native to Burma, East India. At the post-mortem examination the tubercular foci were found to be very large and many of them were inclosed within firm capsules. The pleura, pericardium, heart, lungs, thoracic glands, liver, peritoneum, and mesenteric glands were more or less involved.

11. *Culture Monkey 11.*—From the lung of a medium-sized brown monkey in which tuberculosis was very completely generalized this culture was isolated. In addition to the involvement of lungs, liver, spleen, and both thoracic and abdominal glands, the axillary and inguinal glands were greatly swollen and contained large areas of caseous material. To judge from the macroscopic appearance one would say that the primary lesion must have been located in one of the external glands in the axillary region.

12. *Culture Monkey 12.*—The animal from which this culture was obtained was 2 years old, weighed 10½ pounds, and was the property of a prominent actress. Post-mortem examination showed enlarged caseated right retro-

pharyngeal lymph gland and extensive tuberculosis of the lungs with involvement of the bronchial and mediastinal lymph glands. The liver also contained a few areas of tuberculosis and several mesenteric lymph glands were swollen, with cheesy foci present. No ulcers in the intestines were observed.

13. *Culture Nasua (Bear)*.—This culture was recovered by Theobald Smith and described by him as follows:

"The source of one of the cultures was an animal of the bear tribe (*Nasua narica*). In this animal, which I saw the day after death (May 12, 1894), the tuberculosis was apparently of intestinal origin. A gland at the root of the mesentery as large as a goose egg was converted into a sac filled with a soft, viscid pus. The omentum was extensively studded with small tubercles, but the spleen and kidneys were free from disease. The lungs were permeated uniformly with tubercles, evidently of hematogenic origin. Ulcers were reported as having appeared on the animal before it died. The owner of this animal, who had kept it as a pet, had succumbed to tuberculosis some time before. It is highly probable that this animal had contracted the disease from its master."

14. *Culture Peccary*.—This culture was recovered from the spleen of a peccary received from the National Zoological Park affected with generalized tuberculosis. This animal arrived at the park September 2, 1902, from Maracalbo, Venezuela, and was evidently affected with tuberculosis at that time, as it was greatly emaciated.

15. *Culture Avian*.—The original avian culture from which this was propagated was sent to this country from Kral's laboratory in Prague several years ago. It is from a stock that is well known to bacteriologists, and is accepted by most of them as meeting all the requirements of tubercle bacilli of the avian type.

16. *Culture Parrot*.—Isolated in this laboratory from a pet parrot that had lived for some years in the family of a resident of Washington, D. C. There was no positive evidence obtainable which would show that tuberculosis existed in the members of this family, but the hearsay reports concerning the death of one of the sons, a young man grown, make it seem very probable that his demise was due to tuberculosis. When holding the autopsy on the parrot attention was first attracted to the presence of several small whitish granular bodies adhering to the walls of the cloaca. Stained by Ehrlich's method it was found that these granules contained acid-fast bacilli, but not in great numbers. Further examination revealed a number of small whitish necrotic specks in the walls of the intestines. Acid-fast bacilli were also recovered from these. It was then found that some two or three of the mesenteric lymph glands were tuberculous, but no other evidence of the disease was found. External tubercular growths were entirely lacking. Guinea pigs inoculated with an emulsion of one of the mesenteric lymph glands contracted tuberculosis and served to isolate the bacilli for later cultivation.

METHOD OF WORK.

In order to obtain pure cultures of tubercle bacilli from the original tubercular specimens suspensions in physiologic salt solutions were made and inoculated subcutaneously into guinea pigs ranging from 330 to 480 grams in weight, or a small section of the affected tissue would be placed with aseptic precautions beneath the skin of guinea

pigs, by which means contaminating organisms were eliminated through the action of the protective agencies of the body of the animal, while the more virulent and more persistent tubercle bacilli became fully established. The guinea pig is so susceptible to all forms of tuberculosis that it sooner or later gives evidence of the encroachment of the disease, no matter which type is being tested. These animals may be chloroformed to prevent secondary infections as soon as they begin to give evidence of wasting, which was the rule in our experiments, or they may be kept until the disease terminates fatally. With the more virulent bacilli this loss of flesh was observed about the third week, while the less pathogenic organisms required five or six weeks and sometimes longer. After the death of the test animal bits of tubercular tissue, usually from the spleen or a distal lymph gland, were removed under strict aseptic precautions and transferred to culture tubes containing previously prepared dog serum. The blood was obtained from the femoral artery of healthy dogs by the observance of the usual aseptic measures, the animal being etherized, the artery exposed and punctured by a sterile glass rod conveniently bent, through which the blood was conducted into sterile Erlenmeyer flasks. The serum expressed from the resulting clot was drawn up in sterile pipettes, distributed into Salmon tubes, and hardened in a serum oven at 76° C. on three successive days. These tubes are always kept inclined at an angle of about 10 degrees. The resulting medium is not as hard and dry as when a higher temperature is used, nor is it so soft as to be easily broken when sown with tubercular material. After the first two weeks of incubation the tubercular tissue on the serum is crushed against the side of the tube with a heavy flat platinum needle and spread over the surface of the medium for the purpose of starting fresh colonies. Whenever these procedures result in a pure growth of the tubercle bacilli upon the serum the investigator is supplied with the desired culture, and he can then proceed to take up his comparative study of the organism. For the purpose of providing uniform conditions one incubator only was used, and where possible the transfers, which were made every four to six weeks, were inoculated into tubes containing media from the same batch of serum. The incubator was kept at from 37° to 38° C., and contained a vessel of water to preserve a moist atmosphere.

For information regarding the technique adopted in the staining of the tubercle bacilli and the method and dose of the inoculations the reader is referred to Bulletin No. 96 of the Bureau of Animal Industry.

VARIATIONS IN MORPHOLOGY, CULTURAL CHARACTERISTICS, AND PATHOGENESIS.

EXPERIMENTS WITH CULTURE GIRL I.

This culture originated in April, 1902, and when first isolated grew rapidly and bulkily upon dog serum. Subcultures made perceptible increase in size by the fourth or fifth day and gradually extended all over the surface of the medium, presenting a white granular appearance. Cultures recovered after passage through the rabbit were similar to the original in appearance, and after artificial cultivation for four years the most marked alterations were a tendency toward a more pronounced grouping or heaping up in the manner of growth, and to a less spreading vegetation.

The individual organisms forming this culture varied in length originally from $1.5\ \mu$ to $3\ \mu$. They were slender and more or less curved and beaded. (Pl. XVI, fig 1.) Repeated passage of this culture through guinea pigs and rabbits failed to produce any noticeable alteration in their form, unless it may have been to add slightly to their thickness. Recovered after final passage through a cow, they were found to average shorter and to be more slender, although they still failed to resemble the bovine type. (Pl. XVI, fig. 2.)

The virulence of Girl I culture was early proved to be slight, but later work showed conclusively that it could be accentuated most materially. In order to give it a more pronounced degree of virulence, a pure culture recovered upon dog serum from an axillary gland of rabbit No. 824 of the following table was passed as rapidly as possible through a series of guinea pigs by means of intra-abdominal inoculations. After the first guinea-pig inoculation all material for further injections was procured by emulsifying tuberculous centers from the preceding guinea pig of the series in physiologic salt solution, and the culture was in this manner passed from animal to animal. The average duration of life of the animals of this series was nineteen days. A notable difference was evident between the virulence of the culture used upon rabbit No. 824 and that evidenced by the culture recovered after passage through the series of guinea pigs. Rabbit No. 824 survived subcutaneous inoculation with 1 c. c. of this culture for one hundred and seventy-three days. Rabbits Nos. 1250 and 1220, inoculated in a similar manner with 1 c. c. of the culture immediately after its passage through the guinea-pig series, survived for only thirty-four and thirty-five days, respectively, while a series of seven rabbits inoculated under identical conditions with this culture after it had gained its accentuation survived but an average period of forty-three days.

The above-mentioned changes are shown at a glance in the following table:

Table showing accentuation in virulence of culture Girl I after passage through a series of twenty-two guinea pigs.

Number of rabbit.	Material inoculated (dose 1 c. c.).	Days alive.	Remarks.
369	Original culture.....	177	Average days alive with use of original culture, 118½.
574	Tissue from rabbit No. 369.....	67	
748	Tissue from rabbit No. 574.....	58	
824	Tissue from rabbit No. 748.....	173	
1250	Accentuated culture from rabbit No. 824.....	84	Average days alive with use of accentuated culture, 48.
1220	do.....	86	
1242	do.....	52	
1364	Tissue from rabbit No. 1242.....	42	
1429	Tissue from rabbit No. 1364.....	38	
1463	Tissue from rabbit No. 1429.....	52	
1479	Tissue from rabbit No. 1463.....	48	

* A pure culture from an axillary gland of this rabbit was passed through twenty-two guinea pigs by means of intra-abdominal inoculations. Average duration of life of guinea pigs, 19 days.

It is here shown that the virulence of the culture was so affected by the treatment to which it was submitted that it would cause the death of rabbits in forty-three days under conditions identical in every particular with those surrounding the first series, in which death was not caused until one hundred and eighteen days had elapsed:

The changes in morphology during this transition were not of sufficient moment to be worthy of further comment, but on later passage through cow No. 361 they underwent slight change, as will be seen by reference to Plate XVI, figure 2.

Culturally, Girl I was slightly more reluctant to grow after its accentuation, and the appearance of the growing culture upon the surface of the media was that of a thinner, whiter layer after similar periods of inoculation.

The culture was recovered from rabbit No. 1220 in a state of purity, and has since been cultivated to the twenty-fourth generation under artificial conditions.

When first isolated, Girl I culture was completely nonvirulent for cattle. Cow No. 299, about 1 year of age when inoculated, after being submitted to the tuberculin test was injected subcutaneously on each side in the region of the shoulder with 2 c. c. of a suspension in physiologic salt solution. The material used was a culture of the fourth generation, grown upon dog serum. The health of the animal was apparently unaffected. Slaughtered one hundred and fifty-three days afterwards, the heifer was found to be in good condition and free from all lesions of disease.

Contrasted with this, but under unlike conditions, because of intravenous injection, considerable interest must attach to the inoculations of cows Nos. 361 and 348. These animals were aged, respectively, 17 and 16 months at the time of their inoculation, and both, like cow

No. 299, had been tested with tuberculin. The material used was the accentuated culture recovered on dog serum from rabbit No. 1220 of the accentuated series. This culture was emulsified in bouillon, strained through sterile cotton and injected into the jugular vein, 1 c. c. being given to each of the heifers. Their temperatures remained stationary for about one week, when a slight elevation was noticeable. This was gradually augmented until the fever became intense and breathing difficult. The animals died on the twentieth and thirty-first days, respectively, showing the establishment of countless miliary foci throughout the lungs and all of the thoracic lymph glands. In addition to numerous small foci in the lungs, these organs showed marked edematous suffusion. There was no abscess formation at the point of inoculation, the lesions being all confined to the organs of the thoracic cavity. Cultures from cow No. 361 were readily recovered on artificial media. They failed to grow with quite the profusion shown by the original Girl I cultures, but spread out in a thinner layer over the surface of the media. It will be noted that, while changed somewhat from the original human type and made to approach the bovine type in many important respects, this culture was not brought to the point where it could be said to represent the bovine type. Its ready growth when recovered from cow No. 361 and its deviation from the typical bovine morphology serve to prove that further passage through cattle would be necessary to make the transformation more nearly complete.

EXPERIMENTS WITH CULTURE SPUTUM C.

This culture made only a very reluctant growth when first isolated, requiring three weeks or more for evidence of growth in subcultures. Later transplantations grew more readily, except those recovered after passage through cattle and sheep. These presented very tardy growths for more than a year after being recovered and isolated, always showing thin, veil-like forms of growth, with a sprinkling of minute white granules scattered over the surface. These bore a very close resemblance to typical bovine cultures.

This culture was unusually virulent for one obtained from sputum. Passed through a series of rabbits, it was noted that the bacilli passed quickly from the point of inoculation to the internal organs and began immediately to exert their destructive influence. Passed through a series of cats, an increase of virulence was apparently gained by its passage from animal to animal. Applied to cattle and sheep in the form of an emulsion of the early cultures, only local lesions were developed, but after passage through the series of rabbits or cats just mentioned sufficient increase of virulence was obtained to enable them to cause generalized tubercular invasion through subcutaneous injections in both cattle and sheep.

DESCRIPTION OF PLATE XVI.

- FIG. 1. Tubercle bacilli from original culture Girl I.
- FIG. 2. Tubercle bacilli from culture Girl I, after bovine passage.
- FIG. 3. Tubercle bacilli from original culture Sputum C.
- FIG. 4. Tubercle bacilli from culture Sputum C, after passage through cats.
- FIG. 5. Tubercle bacilli from culture Sputum C, after passage through cattle.
- FIG. 6. Tubercle bacilli from original culture Boy V.
- FIG. 7. Tubercle bacilli from culture Boy V, fifteenth generation.
- FIG. 8. Tubercle bacilli from culture Boy V, after passage through cats.

DESCRIPTION OF PLATE XVII.

- FIG. 1. Tubercle bacilli from original culture Case XIV.
- FIG. 2. Tubercle bacilli from culture Case XIV, after passage through cats.
- FIG. 3. Tubercle bacilli from culture Case XIV, after passage through sheep.
- FIG. 4. Tubercle bacilli from original culture Bovine S.
- FIG. 5. Tubercle bacilli from culture Bovine S, thirteenth generation.
- FIG. 6. Tubercle bacilli from culture Bovine S, grown on solidified human blood serum.
- FIG. 7. Tubercle bacilli from culture from vertebral lesion of cow.
- FIG. 8. Tubercle bacilli from culture Bovine S, after passage through cats.

DESCRIPTION OF PLATE XVIII.

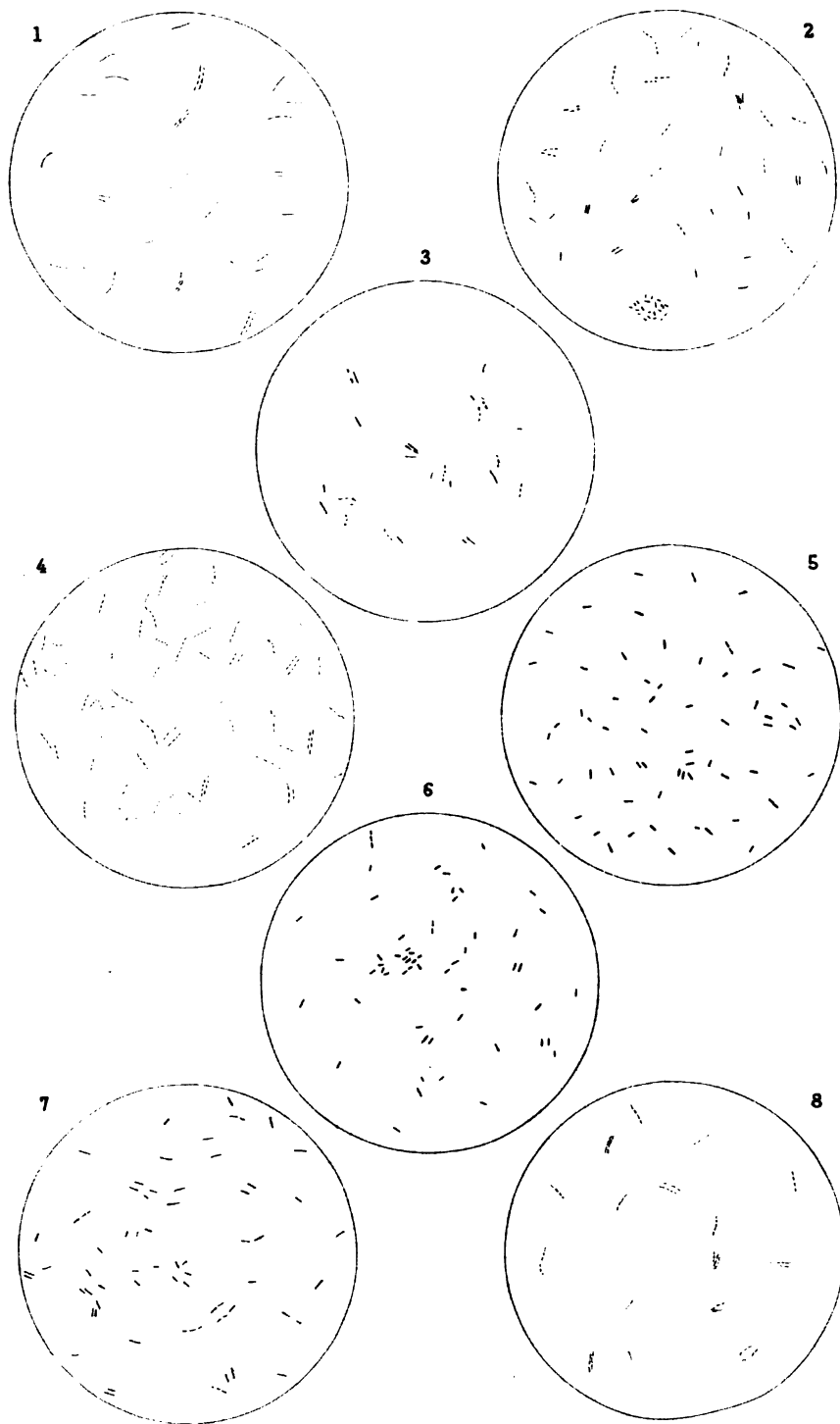
- FIG. 1. Tubercle bacilli from original culture Hog O.
- FIG. 2. Tubercle bacilli from culture Hog O after passage through cats.
- FIG. 3. Tubercle bacilli from culture Hog O after passage through rabbits.
- FIG. 4. Tubercle bacilli from original culture 7, canine.
- FIG. 5. Tubercle bacilli from culture 7, canine, twenty-third generation.
- FIG. 6. Tubercle bacilli from original culture 8, European deer.
- FIG. 7. Tubercle bacilli from original culture 9, Mexican deer.
- FIG. 8. Tubercle bacilli from original culture 10, Sambur deer.

DESCRIPTION OF PLATE XIX.

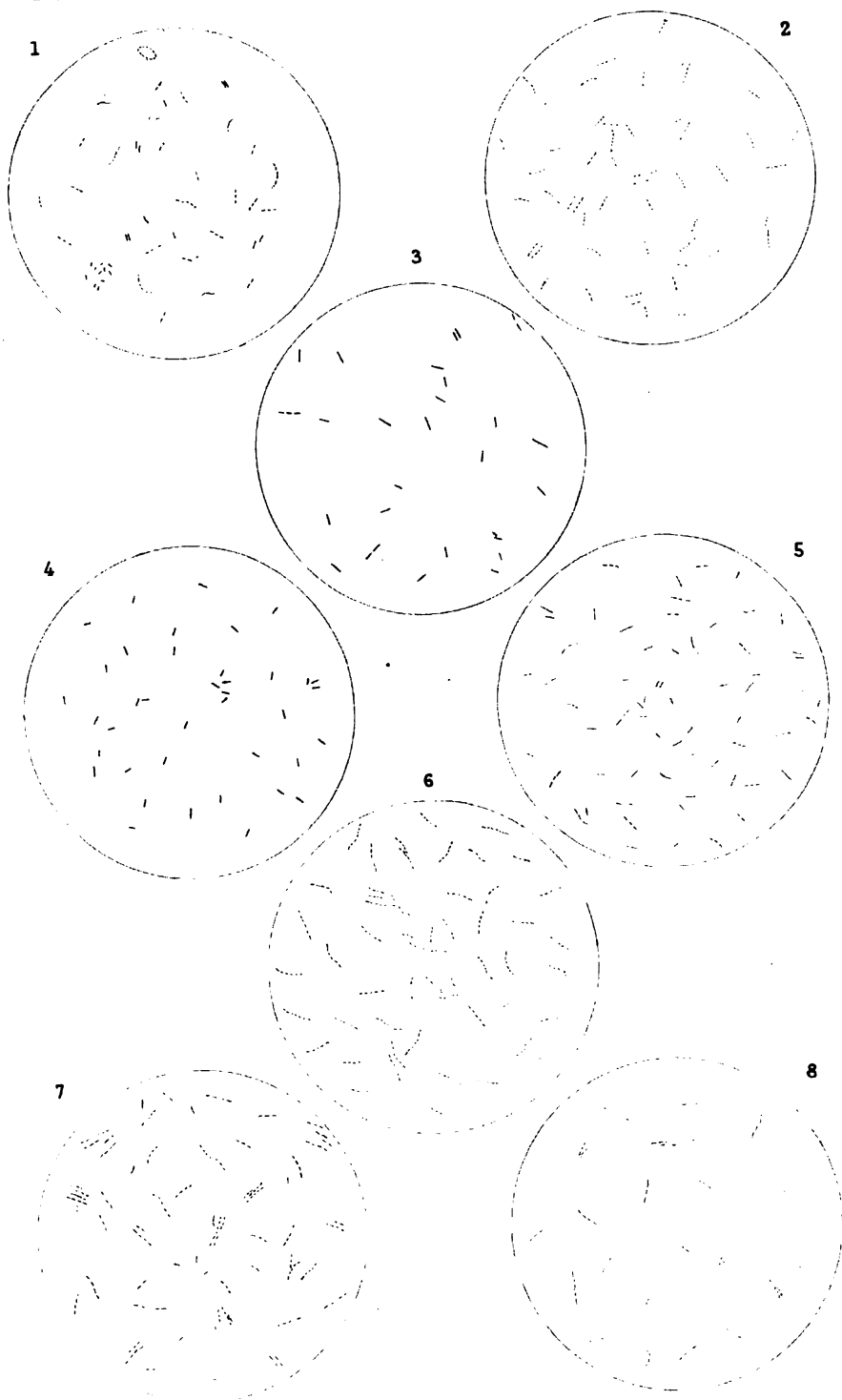
- FIG. 1. Tubercle bacilli from original culture 11, monkey.
- FIG. 2. Tubercle bacilli from original culture 12, monkey.
- FIG. 3. Tubercle bacilli from culture 14, peccary, after passage through cats (first generation).
- FIG. 4. Tubercle bacilli from culture 14, peccary, after passage through cats (sixteenth generation).
- FIG. 5. Tubercle bacilli from culture 15, avian, seventh generation in this laboratory.
- FIG. 6. Tubercle bacilli from culture 15, avian, after passage through a series of guinea pigs and rabbits.
- FIG. 7. Tubercle bacilli from original culture 16, parrot.
- FIG. 8. Tubercle bacilli from culture 16, parrot, sixteenth generation.

Unless otherwise stated, the above-described tubercle bacilli were from solidified dog-serum cultures of from nineteen to twenty-seven days' growth.

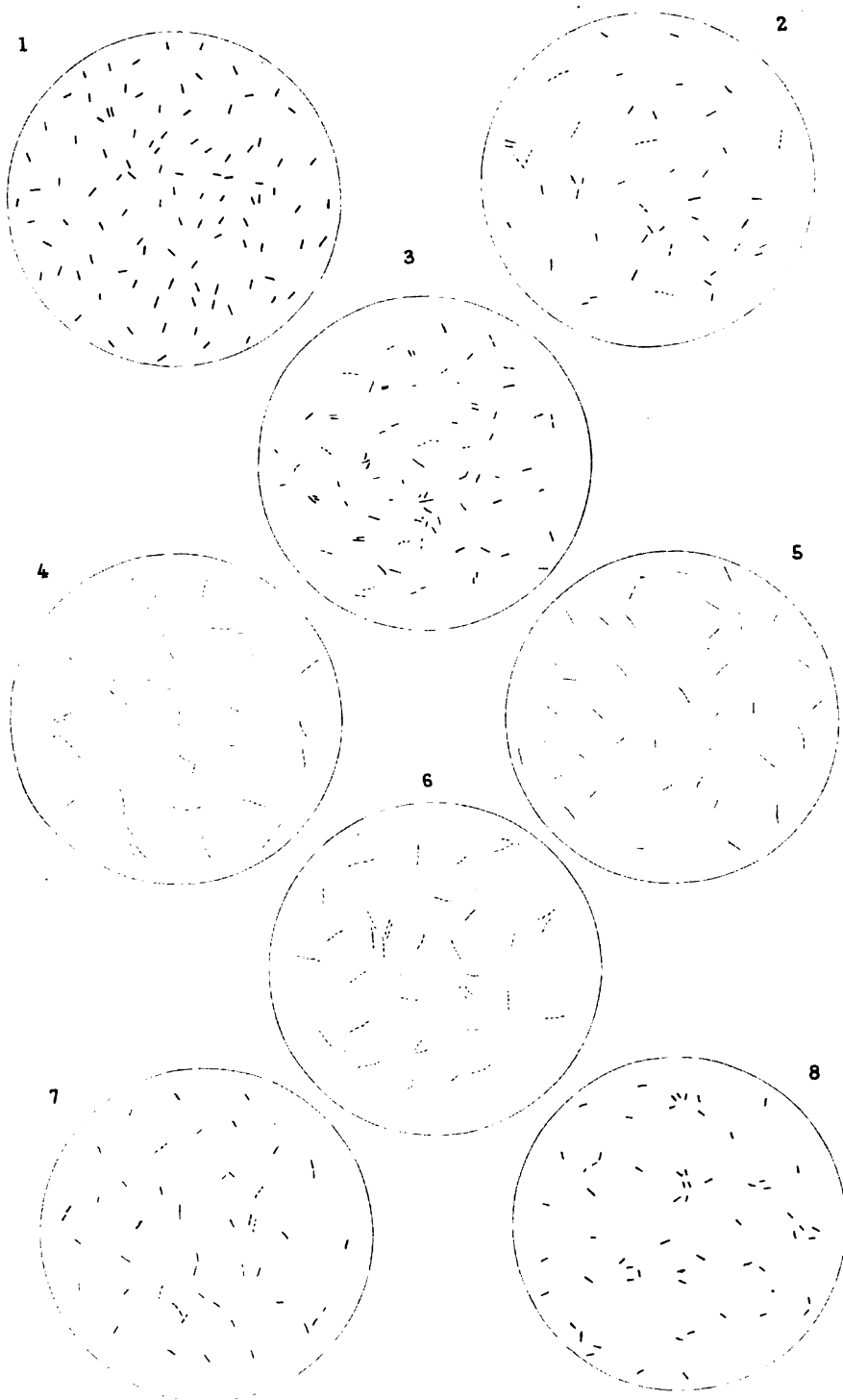
The drawings were made with camera lucida at base of stand with Zeiss 2 mm. oil immersion objective and No. 4 compensating ocular (x 900), after staining with carbol-fuchsin and decolorizing with 20 per cent sulphuric acid.



TUBERCLE BACILLI OF HUMAN ORIGIN.

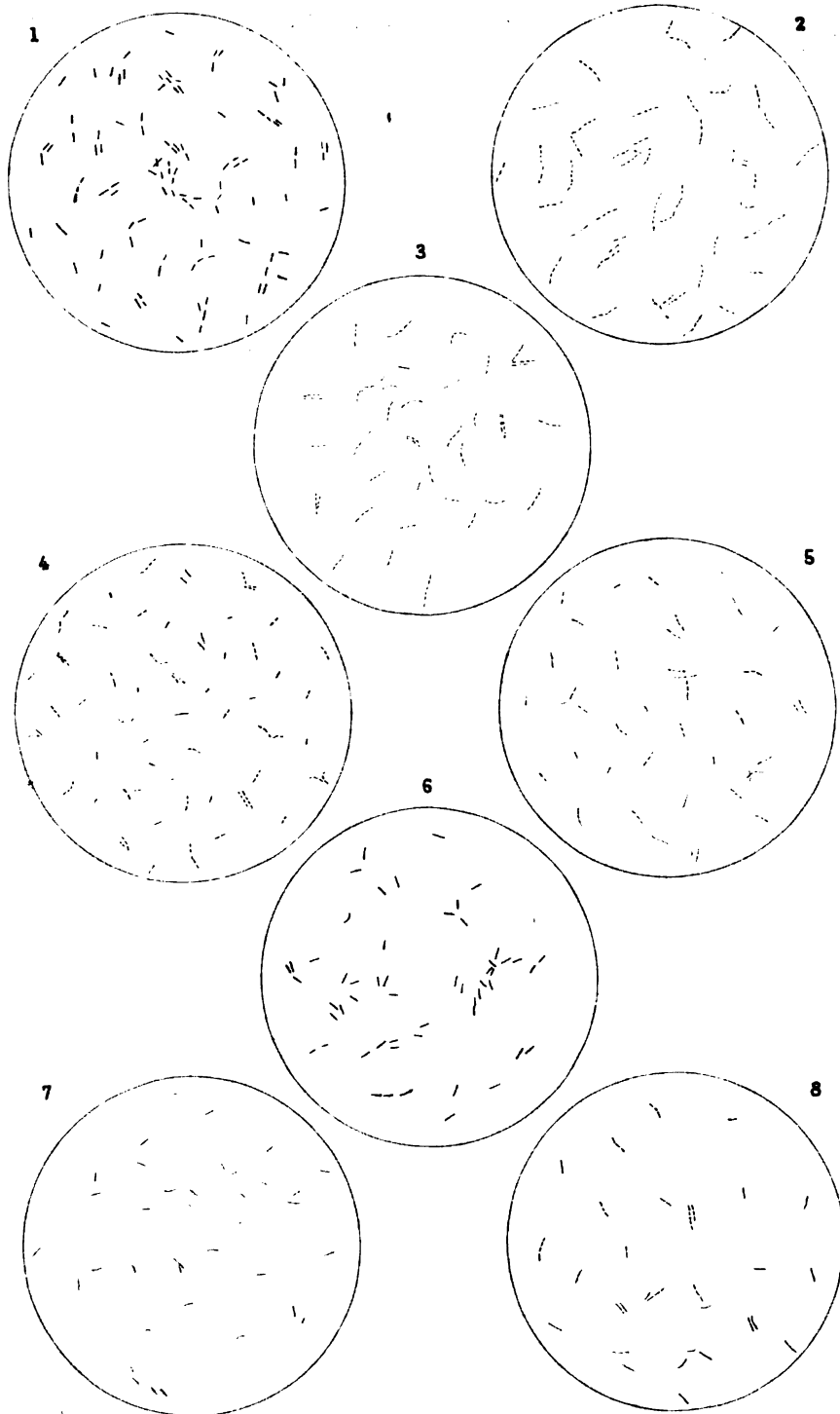


TUBERCLE BACILLI OF HUMAN AND BOVINE ORIGIN.
(1, 2, 3. Human; 4, 5, 6, 7, 8. Bovine.)



TUBERCLE BACILLI FROM HOG, DOG, AND DEER.

(1, 2, 3, Hog; 4, 5, Dog; 6, 7, 8, Deer.)



TUBERCLE BACILLI OF MONKEY, PECCARY, CHICKEN, AND PARROT.

(1, 2, Monkey; 3, 4, Peccary; 5, 6, Chicken; 7, 8, Parrot.)

This increase in virulence is strikingly presented in two cattle, Nos. 300 and 312, which, after testing with tuberculin, were inoculated subcutaneously in front of each shoulder with 2 c. c. of physiologic salt solution containing a suspension of tubercle bacilli from Sputum C. One of the animals, No. 300, received in this manner bacilli which had been cultivated artificially for four generations upon dog serum without passage through any intermediate animal other than the guinea pig first used to isolate the organism from contaminating bacteria also present in the sputum. The other cow, No. 312, was inoculated with material from the same source originally, but instead of continued growth in the incubator upon dog serum it had been passed successfully through a series of seven rabbits. An emulsion of the axillary gland of the last rabbit was used for the injection. This animal died on the thirty-sixth day, while the preceding six rabbits succumbed, respectively, on the eighty-second, thirty-third, fiftieth, twenty-first, fifty-eighth, and thirty-fifth day—an average of 46.5 days.

As a result of this comparative test it was shown at the autopsy of these cattle, held, respectively, one hundred and fifty-eight and one hundred and fifty-nine days after inoculation (both animals having been chloroformed), that the organism in the first instance had failed to produce any lasting tubercular lesion whatever, the autopsy being absolutely negative. The lesions present in the second animal, however, showed conclusively that marked increase in virulence had been derived from the repeated passage of the tubercle bacillus through rabbits. The clinical notes show that on the fourteenth day after the inoculation the animal's temperature had risen from 102° to 106° F., the highest point reached, and that acceleration of respiration was noticeable. The temperature gradually receded, although it was variable from day to day. Later observations showed that there was at each point of inoculation a firm, hard tumor, involving the adjacent prescapular lymph glands. The post-mortem notes are as follows:

On the right side, at the point of inoculation, is a small tumor the size of a hickory nut full of thick, yellowish pus. At the opposite seat of injection a tumor is observed the size of a hen's egg, full of caseous material and surrounded by an inflammatory area of granulation tissue. The right prescapular gland is 5 by 10 by 15 cm. in size and contains numerous foci of yellowish calcareous matter. The left prescapular gland is 7 by 10 by 18 cm. in size, hyperemic, and filled with small calcareous areas. The lungs contain some twelve or more scattered grayish tubercular foci, both deeply and superficially located. The anterior and posterior mediastinal lymph glands are greatly enlarged and thickly studded with calcareous tubercular areas. The bronchial lymphatic glands are the size of pigeon eggs and are gritty on section. The costal pleura supports a few inflammatory fibrous neoplasms. The diaphragmatic pleura presents several similar growths. The omentum shows an area

some 2 inches wide across its width, largely scattered over with a slight fringe of like neoformations. The liver contains some fifteen tubercular foci, both superficial and deep. The portal lymph glands are slightly enlarged and contain foci of tuberculosis. Retropharyngeal, submaxillary, and prepectoral lymph glands are swollen and edematous and contain small centers of tuberculosis.

It is interesting to note that not only do sputum bacilli produce tuberculosis in a bovine animal, but the virulence of these bacilli was increased by passage through a series of rabbits, since other sputum bacilli of the same origin which had not been passed through rabbits did not produce any lesions when similarly injected into a heifer. Carried to the second of the series (No. 341) by the injection of an emulsion of the prescapular gland of No. 312, similar reactions were produced in the temperature readings, general course of the disease, and extent of tuberculous lesions developed. The heifer was chloroformed one hundred and twenty-two days after injection, and on post-mortem showed an extension of the infective organisms from the points of inoculation on each shoulder to the prescapular, bronchial, and mediastinal lymph glands, which were thickly studded with tubercular foci. The parietal pleura supported upon both costal and diaphragmatic surfaces many inflammatory fibrous tubercular growths. The lungs contained scattered foci, while liver and portal lymph glands, spleen, and kidneys were also attacked.

Passed from the ninth rabbit of a series to the subcutaneous tissues of the shoulder of a sheep, similar generalized invasion resulted as has just been noted in cows Nos. 312 and 341.

Plate XVI, figure 3, shows the appearance of bacilli from Sputum C when first recovered in 1902. Plate XVI, figure 4, indicates the usual lengthening and beading produced by the introduction of tubercle bacilli into a series of cats, while Plate XVI, figure 5, presents tubercle bacilli of the Sputum C culture after recovery from the last cow of a bovine series and further cultivation upon dog serum.

EXPERIMENTS WITH CULTURE BOY V.

This culture has always shown the characteristics of bovine tubercle bacilli in form, in virulence for all kinds of test animals, and in its manner of growth under artificial conditions. It proved more virulent than certain bovine cultures that were submitted to comparative tests with it. Individual members of this culture of bacilli adhered to their original bovine type of morphology with great tenacity and only displayed lengthening and beading when subjected to the conditions which develop these changes in tubercle bacilli of bovine origin, viz, long-continued artificial cultivation or passage through carnivora or certain small test animals. This phase of morphological change from the original culture (Pl. XVI, fig. 6) is illustrated in Plate XVI, figures 7 and 8, respectively.

Recovered from a series of dogs, the tubercle bacilli grew upon serum in the manner of human cultures more readily than subcultures from the original culture.

Five years and more of growth under artificial conditions have given this culture the power to respond quickly to transplantation upon fresh media. At first it grew very slowly, but at the present time renewed growth may be detected within nine days after transfer to fresh glycerin-agar. After repeated passage through a series of dogs and of cats the cultures recovered from these animals upon dog serum showed an increased tendency toward the production of large white colonies raised above the surface of the serum as though the addition of material to the little mounds or heaps was being gradually forced into them from beneath.

EXPERIMENTS WITH CULTURE CASE XIV.

This culture disclosed but a low order of virulence when first applied to the common test animals, but its affinity for dogs was sufficiently marked to attract special attention, and it was soon found that passage through a series of these animals had materially increased the virulence of this culture in its attacks upon other laboratory animals.

The following tabulated reports of the inoculation of cattle, cats, and rabbits indicate the pronounced increase of virulence in each series as soon as the material from dog No. 82 was used:

Table showing increase of virulence of culture Case XIV for cattle, cats, and rabbits after passage through a series of dogs.

CATTLE INOCULATIONS.

Number of animal inoculated.	Material inoculated.	Days alive.	Change in weight (+ gain, - loss).	Results.
			Grams.	
304	Culture.....	125	.....	Chloroformed; slight extension to preescapular glands.
314	Tissue from cow No. 304.....	119	.....	Chloroformed; no lesions of disease found.
340	Tissue from rabbit No. 884 injected from dog No. 82.	104	.....	Chloroformed; points inoculated, prescapular and post-mediastinal glands severely attacked.
343	Tissue from cat No. 60 injected from dog No. 82.	35	.....	Dead; lesions widely generalized.

CAT INOCULATIONS.

27	Culture.....	76	+ 396	Chloroformed; costal pleura shows a few tubercular growths.
38	Lesion from cat No. 27.....	87	+ 905	Chloroformed; few slight nodules in lungs and spleen.
53	Lesion from cat No. 38.....	59	+ 482	Chloroformed.
59	Lesion from dog No. 82.....	43	- 238	Pleura and pericardium thickly studded with prominent tubercular growths.
60	Lesion from cat No. 59.....	19	- 226	Tubercular edema of the lungs.
62	Lesion from cat No. 60.....	23	- 396	Inflammatory type of tuberculosis.
66	Lesion from cat No. 62.....	25	- 1,217	Do.
70	Lesion from cat No. 66.....	19	- 368	Tuberculosis of lungs with exudate into thoracic cavity.
73	Lesion from cat No. 70.....	21	- 786	Lungs, liver, and spleen and pleura severely tuberculous.

Table showing increase of virulence of culture Case XIV, etc.—Continued.

RABBIT INOCULATIONS.

Number of animal inoculated.	Material inoculated.	Days alive.	Change in weight (+gain, -loss).	Results.
			<i>Grams.</i>	
853	Culture.....	48	+ 30	Chloroformed; negative result.
844	do.....	57	+ 56	Do.
654	do.....	105	+170	Chloroformed; very mild form of disease.
762	Lesion from rabbit No. 654....	79	+283	Chloroformed; negative result.
834	Culture from dog No. 82.....	28	-226	Chloroformed; progressive spreading case.
864	do.....	46	+ 56	Progressive spreading case.
964	Lesion from rabbit No. 884....	59	-255	Inflammatory type.
783	Lesion from rabbit No. 964....	59	-509	Widely generalized case.
894	Lesion from rabbit No. 783....	57	- 877	Strong growth of pearly bodies upon costal and diaphragmatic pleura.
1134	Lesion from rabbit No. 894....	37	-113	Most serious lesions are in lungs.
1084	Lesion from rabbit No. 1134....	34	-150	Lesions widely generalized.

No fixed standard of morphology could at any time be determined for culture Case XIV. In the slides that were prepared it was usually possible to find short, unbeaded forms together with long, curved, and beaded ones. A glance at Plate XVII, figure 1, where a smear from an original culture is shown, serves to illustrate this variegated character. Recovered after passage through cats, it was found that the short forms had been eliminated and that only long, beaded forms remained. (Pl. XVII, fig. 2.) Recovered after passage through cattle or sheep, the short thick form of the bovine type were found to predominate (Pl. XVII, fig. 3), but in no case was there any uniformity of a lasting nature, as transplanting for several series on dog serum produced similar mixtures of morphology to those found in the early cultures.

EXPERIMENTS WITH CULTURE BOVINE S.

In the isolation of this culture much discouragement was experienced because of its very slow application to growth upon serum. When cultures were obtained they appeared as fine, disconnected granules of slow and feeble development. Subcultures remained apparently inert for three or four weeks even after many generations. Persistent efforts, however, finally overcame their dislike of artificial surroundings and they began to grow more readily. Although this culture was typically bovine in its early morphology (Pl. XVII, fig. 4), it was lacking in the virulence usually ascribed to tubercle bacilli of bovine origin, and after yielding to the effects of its artificial environment there was a perceptible increase in the length of its members, and occasionally beaded rods were to be found. (See Pl. XVII, fig. 5.) Should an investigator obtain a culture possessing the characteristics of the tubercle bacilli shown in this latter plate, he would probably class it either as atypical or with organisms of the human type, both in regard to form and cultural qualities.

An interesting experiment was made by means of cultivating this bovine bacillus upon human blood. Plate XVII, figure 6, represents the recovered organisms after sixty-two days' growth upon the surface of sterilized blood derived from the human subject. As the supply of material for this culture medium was dependent upon uncontrollable circumstances, the experiment was necessarily of limited duration. The long, beaded forms shown in the above plate represent the second generation after having grown for fully two months under unnatural conditions. While no inoculation tests with this altered material were possible, the morphologic changes at least were striking. Bovine tubercle bacilli that have been grown for a like period of time upon dog serum do not show such change of form, but remain for a longer period of time short, straight, and without beading. It is probable, therefore, that the bacilli here described have assumed a more saprophytic character, as a result of some constituent of the human blood, and are capable of more rapid accommodation to its cultural exigencies. In their general appearance and virulence they must now be regarded as closely allied to the type of tubercle bacilli frequently derived from deer and cats. They are essentially bovine in everything except length and beading.

But prominent as these changes are, they are fully equaled by nature, as Plate XVII, figure 7, very clearly proves. These naturally transformed bacilli were recovered from a vertebral lesion in a cow condemned by one of the inspectors of the Bureau of Animal Industry for advanced generalized tuberculosis. The unusual character of these bacilli, considering their bovine source, was quickly noted and a study made of the bacilli obtained from different portions of the carcass. By this means it was shown that bacilli of the human type predominated throughout all parts of the affected animal, but that the exaggerated transformations were most clearly shown in the tubercular ulcers of the bony tissues.

The passage of Culture Bovine S through cats and rabbits gave an increase in length and degree of beading. The course of the disease produced in these animals was less acute than that shown by several of the human cultures tested comparatively with it. Plate XVII, figure 8, illustrates the transformation obtained by retention in the bodies of a series of cats.

EXPERIMENTS WITH CULTURE HOG O.

This culture has proved to be the most virulent specimen for all classes of test animals met with in a thorough examination of more than 35 cultures from widely varied sources, and has retained in large measure the dominant characteristics shown by it when isolated more than five years ago. (Pl. XVIII, fig. 1.) Always a ready grower upon dog serum, long retention upon this material has only

served to give it a more luxuriant growth and to change the fine, granular colonies developed during the early period of its cultivation into larger, more elevated groups of bacilli, which appear as whitish heaps or mounds with a thin intervening layer smoothly covering the surface of the serum. This is the added evidence of saprophytism usually shown by cultures of tubercle bacilli after continuous cultivation under artificial conditions. The usual transformation in morphology was also developed by this means, but in less degree than was evidenced by many of the other cultures used in this work.

Passage through cats produced lengthening and beading, and this change is shown by Plate XVIII, figure 2, to be somewhat permanent in character, as the bacilli fail to return to the straight, stubby form of the bovine type after recovery upon dog serum. Permanent change was also noticed in the manner of their growth after this passage, as they grew more readily and slightly more profusely. Passage through a series of seven rabbits also caused increase of length and a greater tendency toward beading (see Pl. XVIII, fig. 3) than the original culture.

EXPERIMENTS WITH CULTURE 7, CANINE.

As has already been stated in this article, no extended work has been done with this culture and the chief interest which it offers will be found in its extremely long form when removed from its natural host, and in its rapid contraction under artificial cultivation. (See Pl. XVIII, figs. 4 and 5.) After its isolation this culture grew readily upon dog serum for about two years, but was then unfortunately seriously injured through transfer to a defective lot of serum, and the observations of the effects of longer cultivation had to be discontinued.

EXPERIMENTS WITH CULTURES FROM EUROPEAN DEER, NEW MEXICAN DEER, AND SAMBUR DEER.

Culture 8, European deer, was derived from a tubercular growth upon the pleura of a male deer which died of tuberculosis after some six months' stay at the National Zoological Park at Washington, D. C. Nothing is known of the previous history of the animal. Culture 9, New Mexican deer, was recovered from the lung of a small male deer whose history so far as known corresponds very closely with that of the preceding animal. Culture 10, Sambur deer, was recovered from the lung of a large female deer which had lived at the National Zoological Park for nearly two and one-half years. The Sambur variety of deer are natives of Burma, but there is no available record to show whether the individual here referred to was born in that land or in captivity upon American soil.

Since cultures 8, 9, and 10 all originate in deer, they may properly be studied together. The members of culture 8 (Pl. XVIII, fig. 6) when first recovered from the tissues of the animal were long, slender, and beaded, and except for their exact straightness might easily have been mistaken for bacilli of the human type. Culture 9 (Pl. XVIII, fig. 7) offered a marked contrast to culture 8 in the fact that the majority of its bacilli were good representatives of the bovine type, although a few beaded forms were present, while culture 10 (Pl. XVIII, fig. 8) presented no elongated forms and adhered strictly to the bovine type throughout. Culture 10 proved very virulent to test animals, both guinea pigs and rabbits, and as it grew tardily and in the form of a thin, dry covering over the surface of the media, and retained the bovine morphology of its individuals for many months before showing elongation, it must be classed at once with the true representatives of the bovine type. A surprise, however, awaited us in the cultivation of culture 9. Numerous little beadlike growths appeared upon the surface of the serum within two weeks after inoculation of the tubes, and in subcultures the growth was rapid and luxuriant within eight days. There was a tendency toward growth in little piles or mounds identical in appearance with sputum cultures, and the members soon showed both lengthening and beading. In spite of its ready adaptation to serum growth it continued to retain an important degree of virulence. In view of its ready growth in the laboratory upon all of the various culture media commonly used for growing tubercle bacilli and of its assumption of elongated beaded forms, it should be classed as an atypical form or with cultures of a transition form of the human type, even though its origin and virulence would at once declare it bovine.

When transferred to serum media culture 8 proved more reluctant to grow than No. 9, and the growth upon the serum's surface appeared as a very thin layer of dull, dry, granular material. The members, long and beaded from the first, were not materially affected through transfer to artificial surroundings. The degree of virulence evinced by them was at all times moderate. When growth became more free there was soon noticed a slight tendency toward massing or piling up in little white heaps. Everything connected with the growth of culture 8, except its source and its slowness to grow upon serum, served to class it with the human type. As cultures 8, 9, and 10 were obtained from animals that had been on exhibition to the public for sometime, it is at least possible that these animals contracted tuberculosis through contact, more or less intimate, with sputum from some of their consumptive visitors. At all events the isolation of tubercle bacilli which so nearly approach the human type from animals so closely related to cattle should be considered of importance in discussing human and bovine tubercle bacilli.

The natural infection of these three deer, however, offers valuable evidence upon the subject of transformation. There can be no question of infection with bovine tubercle bacilli in this instance through milk or meat, and we must admit that nature has failed to infect these three deer with tubercle bacilli which adhere to any particular type. Instead, taking culture 8 as a proper exemplar of the deer type, we may with perfect propriety call culture 9 a deer-human type, and culture 10 deer-bovine in type. In other words, nature has in these cases modified her deer tubercle bacilli, giving them various characters and qualities corresponding exactly to the soil in which she grew them, and has produced transition forms, which by retention in the body of deer are gradually assuming the properties of the type normally present in that animal. It is possible that deer Nos. 8 and 9 came in contact with tubercle bacilli from a human subject, while deer No. 10 received its infection from a bovine source; but if the tubercle bacilli found in Nos. 8 and 9 were originally of the human type they certainly underwent material transformation during their stay within the bodies of the affected animals. Culture No. 8 showed by its virulence and by its tardy development upon dog serum that it was different from the average human culture, and No. 9 possessed more of the characteristics of the bovine type than are generally found in cultures of the human type. If, on the other hand, the deer were all primarily infected by bacilli of the bovine type, the bacilli of Nos. 8 and 9 gave up their typical morphology during their stay in the bodies of the deer, and culture No. 9 became so altered that it grew as readily upon serum as though derived from sputum or from a human lung.

Again, it might be reasonable to suppose that the differences found in these three cultures of tubercle bacilli were developed through differences in the susceptibility of the deer to tuberculosis, or in the amount of infective material received. Deer No. 10 being the most susceptible, the disease spread with great rapidity and virulence, and in consequence the organisms assumed the form and pathogenicity of the so-called bovine type. The tubercle bacilli attacking deer No. 9 found more resistance to their advance, and the disease therefore developed more slowly and with less intensity, as a result of which many elongated, beaded forms were seen among the tubercle bacilli recovered from the tissues. In deer No. 8 still greater resistance may have been met, as a consequence of which only beaded forms were to be found.

EXPERIMENTS WITH CULTURES 11 AND 12, MONKEY.

Comparison of cultures 11 and 12 (Pl. XIX, figs. 1 and 2) shows a transformation by nature's method similar to that just cited in the deer cultures 8, 9, and 10. Culture 11 was isolated from a monkey

that had contracted tuberculosis while kept for exhibition purposes in a suburban park in New England. In this case the bacilli closely adhered to the bovine type. They possessed great pathogenicity for test animals, and in cultural characteristics they followed the requirements of bovine bacilli. Culture 12 was at all times true to the characters of human cultures. The original growth appeared on the sixth day and developed in dry, scaly masses of whitish color and considerable depth. Transfers to subcultures showed prompt and luxuriant development. The individual members were long, beaded, and in some instances slightly curved, while the bacilli from culture 11 were short, straight, and without beading. Their wide separation morphologically may be seen by referring to the above-mentioned figures in Plate XIX.

The differences represented in the morphology as shown by the drawings of cultures 11 and 12 are no greater than the variance shown in their pathogenicity and cultural properties. The examination of many cultures derived from tuberculous monkeys leads us to consider culture 11 as an unusual form to be recovered from these animals after natural infection, as the cultures recovered from monkeys are generally composed of long, slender, beaded bacilli which have but a moderate degree of virulence.

EXPERIMENTS WITH CULTURE 13, NASUA (BEAR).

Theobald Smith isolated this culture from an animal of the bear tribe in 1894. At that time he found that it possessed the following characteristics:

Primary cultures upon dog serum did not show distinct signs of life until fifty-three days after inoculation. Subcultures upon cattle serum were fairly vigorous after the second generation, growing as a thin uniform expansion over the surface of the serum, which assumed the appearance of ground glass. When the fifth generation was transferred to dog serum a very rich, whitish growth formed within two weeks.

Tested upon guinea pigs by subcutaneous inoculation of pure cultures, the seventh generation was found capable of causing fatal results to these animals from generalized tuberculosis in thirty-one to seventy-six days.

Cultivation of this culture has been continuous in the Pathological Laboratory of the Bureau of Animal Industry up to the present time. It has been propagated upon agar during these twelve years, and at the present day will grow rapidly upon this medium, showing manifest growth within thirty-six hours after being placed in an incubator at 37° C. Should the tubes then be taken from the incubator and kept at room temperature the extension of the growth over the surface of the agar and even along the sides of the culture tube will continue. The mass of culture thus developed has the appearance of a strip of thin, whitish, dry felting. Wrinkles form upon the surface

of the growth as time passes, and the white color assumes a rosy tinge.

The pathogenic properties of this culture have disappeared during the course of their transformation until at the present time the injection of guinea pigs and rabbits with large doses will produce no visible result.

EXPERIMENTS WITH CULTURE 14, PECCARY.

Although the smears made from the original tissues of the peccary showed many elongated bacilli with a small amount of beading, subsequent examination of the isolated culture showed that it ranked close to the bovine type in both form, virulence, and cultural characteristics. Three cats inoculated intrathoracically with this organism succumbed in twenty, twenty-two, and twenty-eight days, respectively. Recovered from these animals, the morphology of the tubercle bacilli was found to have undergone marked transformation. They had assumed during their feline passage greater length and more general beading. (Pl. XIX, fig. 3.) Planted upon dog serum, a steady reversal toward the form first obtained from the peccary was noticed, and by the sixteenth generation of dog-serum cultivation the form shown in Plate XIX, figure 4, had been reached.

EXPERIMENTS WITH CULTURE 15, AVIAN.

Starting with a culture of avian tubercle bacilli which was universally well known and very generally accepted as a perfect representative of the avian type, material alterations were obtained by means of animal passage. The growth of this culture upon dog serum was rapid and profuse. The material thus formed spread out evenly over the surface of the serum and at all times presented a moist, slimy appearance. If kept in the incubator at 37° C. until a satisfactory growth was obtained, and then removed and kept at room temperature, it was seen that the original mass of the bacilli of this avian type would remain moist for several months, and that the pearly-white color would show no change.

In order to alter the character of these avian tubercle bacilli as rapidly and as completely as possible they were passed through a series of guinea pigs by means of intra-abdominal injections, then through a series of rabbits, inoculated in the ear vein, and also from the guinea pig series into a cat intrathoracically.

The material used for the first inoculation was the seventh generation of growth after its receipt by the Pathological Division. During the period of these seven transplantings the bacilli were cultivated solely upon dog serum. At the time of inoculating the first guinea pig of the series the tube from which the bacilli of avian type were taken had been inoculated for forty-five days and showed a luxuriant development of moist, pearly-white aggregation, which practically

covered the entire surface of the media. Microscopic slides prepared from this material showed great masses of bacilli, from which the individuals shown in Plate XIX, figure 5, were sufficiently isolated to permit of their being measured and drawn.

Tabulated, the inoculations of animals appear as follows:

Result of inoculations of culture 15, avian, into guinea pigs, rabbits, and a cat.

Number in series.	Number of animal.	Amount injected.	Days alive.	Loss in weight.	Number in series.	Number of animal.	Amount injected.	Days alive.	Loss in weight.
		<i>c. c.</i>		<i>Grams.</i>			<i>c. c.</i>		<i>Grams.</i>
1	Guinea pig 4136.	1.00	39	.....	7	Guinea pig 4907.	0.75	22	.....
2	Guinea pig 4668.	.75	20	.....	8	Rabbit 1123	.50	6	.....
3	Guinea pig 4761.	.75	41	.....	9	Rabbit 1180	.25	46	368
4	Guinea pig 4787.	.75	10	.....	10	Rabbit 1218	.10	25	566
5	Guinea pig 4781.	.75	36	.....	11	Rabbit 1209	.10	18	461
6	Guinea pig 4728.	.75	54	.....	8	Cat 78	1.00	23	934

On making an examination of the first guinea pig of the series, No. 4136, after its death, no tubercular foci were apparent, but the microscope revealed the presence of many tubercle bacilli in the spleen and in an inflamed area at the point of inoculation. Passing to guinea pig No. 4907, the seventh of the series, the following notes were made at the autopsy:

Point of inoculation shows no abscess formation, but a dense whitish tubercular growth has insinuated itself between the abdominal muscular coats. Pre-crural glands, evidence of tubercular infiltration. Peritoneum thickly sown with white tubercular growths over its entire visceral surface. Mesentery and omentum support many small white tuberculous neoformations. Mesenteric glands swollen and contain many small white foci. Liver contains numerous irregular yellowish tubercular areas. Spleen thickly studded with millary foci. Kidneys thickly covered with superficial tubercular growths. Supra-renal bodies inflamed and support a few white foci. Pancreas permeated with areas of caseous degeneration. Testicles appear enlarged, of a grayish red color, and are filled with millary foci. Thoracic lymph glands are swollen and tuberculous. Pleura supports a few small white tuberculous neoformations in the region of the sternum, and also upon its diaphragmatic surface. Lungs, edematous and show many newly forming tubercular localizations.

The duration of life recorded for the several guinea pigs of the series shows the greatest variation without any apparent reason therefor. The power of the bacilli to invade the guinea-pig organism and attack the tissues therein shows, on the other hand, constant accession until the most widely generalized tubercular lesions were produced in the seventh of the series. Although several in the series succumbed after a shorter period and No. 4907 had to be chloroformed on account of its apparent resistance to the effect of the bacilli, the avian culture was evidently transformed to such a degree by this time that it would promptly develop tubercular lesions if introduced into the abdominal cavity of guinea pigs. To further test its patho-

genicity, rabbit No. 1123 was injected in the ear vein with 0.5 c. c. of an emulsion of the spleen of guinea pig No. 4907 rubbed up in physiologic saline solution and filtered through sterile absorbent cotton. The results proved that the number of tubercle bacilli injected was too great, as the animal lived but six days. Tubercle bacilli were present in lungs and spleen in great numbers after death, and the lesions produced by them indicated the most rapid invasion and an immediate attack upon the tissues of the experiment animal.

Finding that one-half of a cubic centimeter of this material was more than could be borne by a rabbit intravenously, only one-half of that amount was used in the next inoculation of a rabbit. The inoculation of cat No. 78, a large animal weighing 3,458 grams at this time, intrathoracically with 1 c. c. of the same emulsion that was used in the inoculation of rabbit No. 1123 verified the demonstration of great virulence and toxicity for mammals shown by its effect upon rabbit No. 1123. In this instance the effect upon the cat was fully equal to that produced by similar injections of tubercle bacilli of the bovine type in other cats in comparative test. Death occurred in twenty-three days, and the loss in weight reached 934 grams, or a little more than 2 pounds. The thoracic cavity was filled with serous exudate, in which a number of flocculi were present. Pleura and pericardium were thickened with tubercular excrescences. The lungs were thoroughly injected with tubercular areas of various sizes. The spleen was greatly enlarged and supported many tubercular nodules varying in size from a grain of wheat to a pea. The liver contained a few scattered foci.

The above post-mortem results of cat No. 78 proved that harmless avian tubercle bacilli may be brought to so high a degree of virulence that they will cause fatal generalized tuberculosis in a mature cat through intrathoracic inoculation.

Wishing to continue the transformation further, rabbit No. 1180 was inoculated with 0.25 c. c. of an emulsion in physiologic salt solution from the lung of rabbit No. 1123. Generalized tuberculosis resulted, with death in forty-six days. Reference to the table of inoculations already given will show that rabbits Nos. 1218 and 1209 were inoculated as later members of the series, and it was found that the transformation of the bacilli when recovered from these animals and cultivated on dog serum was not limited to pathogenicity, but that the appearance of the growing cultures was materially altered. Instead of spreading uniformly over the surface of the serum in a moist white layer, as at the beginning of the experiment, the increase in material appeared in small whitish clumps somewhat similar to the manner of growth common to tubercle bacilli of the human type, except that the little clumps or piles were flatter. A similar

change in the manner of growth in cultures recovered from the first rabbit of the series was found to persist for three transplantings made thirty days apart, but later generations slowly acquired the capability of growing in a thick layer over the surface of the serum. They never, during eighteen months of artificial cultivation, returned fully to their original character, as the mass, while spreading thickly over the entire surface of the serum, did not assume the moist, shining appearance of the avian type of cultures, but remained dry and wrinkled. The transformation was more complete and more permanent in bacilli from the last rabbit of the series. While retaining its virulence as well as most cultures subjected to growth upon artificial media, there has been no reversion to its early profusion of reproduction, and the growths in the culture tubes still closely resemble those of the human type of tubercle bacilli.

Viewed under the microscope the most marked change to be noted is a general increase in the width of the individuals (Pl. XIX, fig. 6) and the disappearance of all beading.

EXPERIMENTS WITH CULTURE 16, PARROT.

When first isolated from the glandular tissue of a tuberculous parrot the pathogenicity of this culture for guinea pigs was not of a high order. The first guinea pig inoculated with it lived for fifty-nine days after subcutaneous injection and was then chloroformed, that the culture might be recovered. It was found that tubercular lesions had become established at the point of inoculation in the adjoining axillary glands and in the lungs and spleen, but while the disease was plainly spreading throughout the body of the guinea pig none of the lesions had reached any marked degree of development during the fifty-nine days since the introduction of the tubercle bacilli into the organism of the test animal.

Passed by similar inoculations through a series of four guinea pigs, it was found that the culture gained an increase in pathogenic power until it became able to cause the death of the last animal of the series in twenty-three days. At the autopsy of this animal a tumor having the formation of a circumscribed abscess was found lying in the subcutaneous tissues at the point of inoculation. The material within this tumor was swarming with tubercle bacilli. The axillary glands were swollen and caseous. The lungs were scantily sown with whitish tubercular foci and were infiltrated with the edema of tuberculous inflammation. Liver and spleen were both thickly studded with caseous lesions of large size, those situated near the surface of the organs projecting with considerable prominence. The gastric lymph glands were enlarged and supported caseous foci. Many of the mesenteric glands were similarly affected, especially those of the ileocecal region.

Comparison of the course of the disease and findings at the autopsies of the first and last animals of the guinea-pig series gave sufficient evidence of very material increase in pathogenic power by means of this serial passage. Further tests upon rabbits fully substantiated this conclusion. From the production of tubercular lesions of somewhat limited extent, which did not prove fatal in two months, the character of the tubercle bacilli of this parrot culture became so altered that they could produce fatal tuberculosis in guinea pigs in twenty-three days, with lesions widely generalized.

When transferred to dog serum these parrot tubercle bacilli made but very reluctant growth. They spread out as a very thin, dry film over the surface of the serum, with no tendency toward grouping or toward the formation of ridges. Transplanted upon glycerin-agar there was but very little difference noticeable. In this respect the culture approached one of the characters of tubercle bacilli of the bovine type. The form of the individuals at first was such as to remind one of the bovine type (Pl. XIX, fig. 7), but as its growth upon artificial media progressed there was a noticeable increase of length and beading. (Pl. XIX, fig. 8.)

Without attempting to determine the source of the tubercle bacilli here dealt with further than to trace them to the parrot, it must be admitted that they are unlike any of the cultures of avian tubercle bacilli in our possession, and that they, like some tubercle bacilli of other types, are susceptible of material modifications, the altered morphology in this instance appearing to be permanent. Parrots in general appear, like monkeys, hogs, and guinea pigs, to be equally susceptible to tubercle bacilli of the bovine and human types, and they are also quite sensitive to the avian bacillus. One type is quite as likely to be met as the other when tuberculosis of parrots is being investigated.

CONCLUSIONS.

In view of the results obtained by the investigations here recorded it seems justifiable to state that—

1. In certain instances tubercle bacilli may be transformed, not alone in form, but in their pathogenicity and cultural characteristics as well. More than this, a culture which seems incapable of attacking certain species of test animals with the degree of severity which one would expect in view of its average virulence for animals of other species may be brought to change its peculiar affinities until it will prove virulent for a series of the animals that formerly could not be affected.

2. Many of the virulent cultures may be attenuated by continued artificial cultivation. It seems probable that a culture may also be attenuated by subcutaneous introduction, in small numbers, into

animals which possess great immunity toward that particular culture.

3. The opposite change—increasing the virulence—may be obtained for some cultures with a low order of original virulence. This transformation may seem to be utterly impossible if one follows the course of inoculating rabbits with small numbers of the bacilli. Several investigators have recorded failures through the use of this method, and have reached the conclusion from tests of this sort that tubercle bacilli can not be transformed thereby. In the tests here recorded it has been shown that culture Girl I has been gradually brought up in virulence until, from being only mildly harmful to rabbits, it became highly virulent for cattle. Culture Case XIV, at first manifesting medium pathogenicity for ordinary test animals, but possessing the power of affecting dogs, has been so markedly accentuated, by humoring its affinity and passing it through a series of dogs, that it gained a high degree of general virulence. With culture 15, avian, the transformation has been complete, the virulence of this culture having been so enhanced that guinea pigs, rabbits, and cats were readily infected by it, and in these animals lesions were produced similar to those obtained by the use of tubercle bacilli of the bovine type. Culture 16, parrot, also evinced considerable increase in virulence, or, perhaps one might better say, became better adapted to growth in mammalian tissues.

4. Differences in the results of animal inoculations may be due to subjective reasons, such as individual susceptibility or resistance, the amount of bacilli injected, the method of the injection, the accidental penetration of a blood vessel in making a subcutaneous inoculation, also the particular time of the injection and the condition of the animal at that time.

5. Cultural qualities of tubercle bacilli may be changed as completely as their virulence. In fact, cultural characteristics change to a greater or less degree as the pathogenicity of any particular culture becomes altered. As the bacilli become attenuated by continued artificial cultivation, it will be noticed that they are at the same time becoming accustomed to their new surroundings and are growing more readily, thereby producing altered masses of material upon the surface of the media. Those who have carried out extensive investigations with tubercle bacilli must have noticed bovine cultures that have been grown in the laboratory for several years (either on liquid or solid media) that have by this means completely lost their resemblance to the bovine type, which they represented so perfectly a few years previously. An instance of this is shown by a bovine culture in this laboratory which has been grown for eleven years under artificial conditions and which will now, upon the surface of glycerin-bouillon, develop in a comparatively short time a thick white mat,

by no means like the thin, tissue-paper layer commonly developed by tubercle bacilli of the bovine type under these conditions. Culture Hog O is another instance in which a culture which was at first strictly bovine in every particular has assumed the form of cultural development supposed to be characteristic of tubercle bacilli of human type. When culture 15, avian, had acquired sufficient virulence through rapid animal passage to invariably prove acutely pathogenic to cats or rabbits, it gave up its former manner of growth upon artificial media and appropriated that of mammalian cultures instead.

6. Natural infection of two monkeys, cases 11 and 12, with tubercle bacilli of widely contrasted types, should only serve to emphasize the fact that tubercle bacilli of the bovine type are dangerous to these animals, and therefore presumably so for man. No argument for or against the unicity of tubercle bacilli could be based upon this comparison until it had been shown that the monkey producing tubercle bacilli of the bovine type had never been fed upon milk or meat from tuberculous cattle or otherwise exposed thereto.

7. The recovery from three deer, naturally infected, of three cultures of tubercle bacilli which possess very dissimilar characteristics shows that either these animals are susceptible to various forms of tubercle bacilli or else nature has been able to work a transformation in some of these cultures either from the bovine type to something approaching the human type or conversely from human to bovine types. Moreover, we have been unable to isolate from a score of deer any single type of tubercle bacilli peculiar to deer.

8. No specific susceptibility of animals to one particular organism has been noted, but the determining factor depends principally on the virulence of the particular bacillus to which the animal is exposed.

9. The morphology of tubercle bacilli has been found to be their most variable characteristic. Bacilli isolated from tuberculous cattle and found to be short, straight, plump, and without beading—in other words, perfect representatives of the so-called bovine type—may become completely transformed in morphology by passage through the cat or the dog. Bovine tubercle bacilli elongated by continuous artificial culture, or tubercle bacilli recovered from cattle that have been infected with generalized tuberculosis as a result of inoculation with long, beaded tubercle bacilli from sputum or from a human tuberculous lesion, may be found to have become shorter and to have retained only a slight amount of beading, owing to the effect upon them of the bovine tissues. The long, slender tubercle bacilli found in natural infection of the dog are immediately contracted when cultivated upon artificial dog-serum media.

10. Grown artificially, the form of certain tubercle bacilli is promptly altered with almost every change of culture media to which they may be transferred. In fact, the morphology of these tubercle bacilli is so unstable that no dependence should be granted to the finding of certain forms in any particular case of tuberculosis until more extended tests have verified the indications shown by the picture presented by examination under the microscope. Indeed, it will be found that the old taxonomic idea of the fixity of all the characters of the various bacilli is being replaced by a different concept and that to the lowest vegetable forms (bacteria), as well as to the highest plant life, may be applied the conclusion of Darwin that "variations of all kinds and degrees are directly or indirectly caused by the conditions of life to which each being, and more especially its ancestors, have been exposed."

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EPIZOOTIC CEREBRO-SPINAL MENINGITIS OF HORSES.

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DESCRIPTION AND CAUSES OF THE DISEASE.

The disease of horses known as cerebro-spinal meningitis, or staggers, occurs in nearly all parts of the United States, and in certain localities it appears almost every year. It tends to assume an epizootic form in favorable localities during wet seasons, especially such as are characterized by frequent rains alternating with hot sunshine, producing a damp, sultry atmosphere. The latter conditions are most favorable to the production of molds on the various kinds of vegetation upon which animals subsist, and outbreaks of the disease are invariably traceable to unsound or moldy forage or feed or to contaminated water. The disease has likewise been experimentally produced in horses by giving them water to drink which had been previously percolated through moldy silage. Horses at pasture may contract the disease when the growth of grass is such that it mats together, causing the lower part to die and ferment and become moldy, or by drinking from wells or pools containing surface water which is drained through decomposed and moldy vegetation and contains organic matter percolated from these. When the disease appears at times in many horses in the same locality, as in low, flat sections, such as the eastern parts of North Carolina, Virginia, and Maryland and parts of other States where the average elevation of the land is but a few feet above the water level, it is known as epizootic cerebro-spinal meningitis.

In explanation of the word "epizootic" it may be said that it has exactly the same meaning when applied to the diseases of animals that the word "epidemic" has when applied to the diseases of mankind. It is not to be understood as having any reference to or connection with the disease so commonly known as "epizooty," or "the epizootic," a name which has become familiar on account of having been quite generally applied to epizootics of influenza, pink-eye, or the grip. The latter is an infectious specific fever of the horse, ass, and mule of a typhoid nature, having no relation whatever either in cause or character to cerebro-spinal meningitis, or staggers.

No specific bacterium, organism, or virus has been isolated that is capable of demonstration as the causative agent of cerebro-spinal meningitis in the horse. The nature of the affection suggests a narcotic poison introduced from without, rather than a disease due to a germ propagated in the system; and the consensus of opinion among investigators points to the cause of this disease as being associated with molds or parasitic fungi that grow on plants, grains, and other vegetation.

When all the horses of a section are kept under more or less similar conditions and exposed to the same influence at the same time, and that influence happens to be the causative agent of a disease like that under consideration, many of them may become almost simultaneously affected, not as the result of contagion or contact, but as the result of being exposed to the acting cause of such disease at the same time. If this disease happens to be cerebro-spinal meningitis, any success obtainable in its control, the arrest of its progress, and the saving of such animals as are still unaffected or have exhibited evidences of a milder type of the disease must be accomplished chiefly through prophylaxis, or preventive treatment, rather than by means of any medicines that can be administered for its cure. In the light of present knowledge medicines are entirely ineffective in an exceedingly large percentage of cases.

TWO OUTBREAKS IN HYDE COUNTY, N. C.

In the summer of 1901 the writer was assigned to the investigation of a serious outbreak of disease reported, under date of August 22, by Hon. J. H. Small, as existing in Hyde County, N. C., as a result of which it was stated that a large number of horses in the county had either died or were in a dying condition. It would seem proper just at this point to recite in some detail the circumstances connected with this occurrence, by way of illustration.

I proceeded to Bellhaven, N. C., where I was met by Mr. Small, who accompanied me to Scranton, where a practicing physician was in readiness, with a pair of mules and buggy, to take me over the county. The central portion of Hyde County is occupied by a shallow lake, said to have an average depth of but $4\frac{1}{2}$ feet and to be 50 miles in circumference. In contour it forms an irregular ellipse, 7 miles across at the center. In order to go over the county one is obliged to drive completely around the lake, and in following the roads to reach the different farms a distance of about 80 miles must be covered. Immediately after meeting my escort he apologized for his team, stating, "We are all afraid to hitch any of the few horses that have not yet been attacked, as they are being seized and are dying so rapidly that everybody in the county seems to believe that no horses will be left." He added that no mules had yet been affected.

We had not gone very far, however, before it was discovered that this was an error, and that mules, which at first seemed to show some resistance, were being seized with equal facility, and, like the horses, they rapidly succumbed to the disease. The description which he gave me of the trouble, together with what was revealed by the first case visited, led at once to a definite conclusion as to the nature of the disease.

These facts are presented simply with a view to emphasizing the suggestions that will follow in connection with the exceedingly great importance of promptly inaugurating a system of preventive treatment in dealing with this affection, as a disease of such a character and so rapidly fatal leaves but little time or opportunity in a great majority of cases for the action of medicines.

The topography of the country and the situation of Hyde County, N. C.—on tide water—are very favorable for the production of the causes and conditions invariably found to be associated with the occurrence of epizootic cerebro-spinal meningitis of horses. The average elevation of the ground throughout the entire county is said not to exceed $3\frac{1}{2}$ feet. Many of the roads have to be built by chopping down trees, principally cypress, laying them crosswise to the road and covering them with dirt excavated from either side to form ditches for drainage. Cases of the disease are said to occur here every year, but in rainy summers, such as those of 1901 and 1906, when molds luxuriate on plants, grasses, and vegetation, which, with contaminated drinking water from pools and shallow wells, constitute the chief supply of food and drink of many of the animals, the danger of an epizootic outbreak is greatly intensified.

In such cases the losses in horses and mules—the entire dependence of the people in working their farms and in getting about the country—become appalling; hence on this occasion, in their blind efforts to do something to save their desperately sick and suffering beasts, and believing that in such a crisis only the most drastic remedies and radical treatment could be effective, the people proceeded to apply such remedies in a most heroic and vigorous manner. The treatment which I was most frequently informed had been used as I went from place to place, and that which seemed to meet with the most popular favor, consisted in smoking the heads of the sick animals by burning tar and feathers and in the administration of large doses of kerosene and vinegar, which in a number of cases had been poured or injected into the nostrils. Two characteristic symptoms of the disease, namely, the rapid, catching breathing, and the inability to swallow—the latter on account of the paralysis of the muscles of the throat—had evidently suggested to the farmers the necessity for a vigorous line of treatment to combat disease of the

throat and lungs; hence the inhalations of smoke and the administration of supposed remedies through the nose.

In order to secure any degree of success in the treatment of the diseases of our domestic animals it is important that such harsh measures shall be avoided, and that only such remedies be used as may reasonably be expected to assist nature in its efforts to restore a normal state. The physiological action of drugs upon mankind has been learned chiefly through experimentation upon the lower animals, and the indications for their use in the treatment of the diseases of the domestic animals have thus been shown to be practically the same as in the treatment of similar diseases in man when they involve the same organs and anatomical structures of the body. It therefore follows that unnecessarily harsh and radical treatment is to be avoided in both cases with equal care. Except for the fact that cerebro-spinal meningitis is such a fatal malady under the best of medical care and attendance, the great mortality in this outbreak might have been attributed in part to the treatment applied, and the belief seems altogether justifiable that with proper medicines and treatment some of the less acute cases at least might have been saved. As in the case of outbreaks of some other of the serious diseases of live stock, it has been observed that in epizootic cerebro-spinal meningitis those animals which seem to have a considerable degree of resistance and are late in coming down with the disease are more apt to have it in a milder form.

While the remedies which seemed to be indicated were, as far as practicable, prescribed by the writer and administered, the explanation to every one interested, first, as to the source of the disease, and then as to the necessary means of prevention, were given prominence, reference being made to the fact that although in their particular section of country the natural conditions seemed especially favorable, yet in any locality the occurrence of cerebro-spinal meningitis of horses was dependent upon those conditions which are productive of fermentation and the development of molds. As proof of this frequently demonstrated proposition, another equally well-established one was cited, namely, that in those sections of the country in which epizootics of this disease had occurred it had been invariably found that soon after the inauguration of proper hygienic methods of feeding, watering, and sanitation the development of new cases ceased and the disease disappeared.

The following quotation regarding the outbreak of 1906 is made from a letter dated August 1, 1906, received from the physician who drove me over Hyde County in 1901:

I suppose you will be much surprised to hear from me, but we have been having excessively heavy rains which have destroyed practically three-fifths

of all the crops of Hyde County, and now the staggers or some epizootic has struck many of our horses and is killing them very fast in all parts of the county. About 40 horses and mules have died within about three weeks, and the disease is general; almost sure death in all cases, and quite rapid in most cases, from twelve to thirty-six hours; does not seem to favor any; takes some of all kinds, old, young, and middle-aged, fat and poor; the ones that have both good and bad care; some that graze and some that are stall-fed; some that work and others that do not work at all; symptoms about the same as in the epizootic several years ago when you came down here and took a trip with me about the lake investigating the same. We have lost a few horses all along each year, but now everything looks quite gloomy to all of us, for it is quite a hardship on our people. * * * I am quite anxious for you to make us another visit, assuring you that I will either take or send you around the county and assist you all I can in locating the trouble and finding a remedy. We have many new cases to develop almost every day and no remedy. Please give us a little of your time and see if you can help us in any way possible and direct any way that we can get you or some expert here in order to give us some relief.

Letters in the same connection were likewise received by the Department from Representative Small. At the time these letters were received the work of formulating rules to govern the work of the Bureau in conformity with the new meat-inspection law of June 30, 1906, was under way, and as the time for getting the same into operation was close at hand, all of the veterinarians connected with the Bureau work at Washington were pushed to the limit. It was therefore impracticable to comply with these requests, but a circular letter was prepared, giving directions for preventive treatment and the use of such medicines as were considered applicable, and numerous copies were forwarded for distribution among the farmers.

SYMPTOMS.

Following is a brief description of symptoms which it would seem desirable for elucidation to divide into three grades:

1. Those which characterize the most rapidly fatal attacks, in which death takes place within five to forty-eight hours. Such cases are apt to begin with a violent trembling or stupor and extreme weakness, or by actual paralysis, the animals staggering and falling to the ground. Inability to swallow is often a pronounced symptom, the saliva hanging and falling from the lips in strings. There is impairment of vision and usually cramps of the muscles indicated by a rigid contraction, especially of the muscles of the neck, back, and loins, not infrequently causing the head to be drawn back toward the tail. The breathing is usually rapid and catching. The body temperature varies; it is frequently not elevated and may be subnormal, or again it may be up to 104° or 106° F. The pulse is likewise variable during the progress of the disease; it may be almost imperceptible at times, and then again very rapid and irregular. Inability to stand soon

manifests itself and there is delirium, in which the animal lying flat on his side becomes violent, and in his unconsciousness severely knocks and bruises his head, though a deep coma soon renders him quiet until death occurs. In excessively acute cases the animal may fall and die in convulsions.

2. In the second grade of cases some of the symptoms above named, or often a number of them, may be observed, though in a milder form. The first symptoms which usually become manifest are difficulty in swallowing, slowness in mastication, and inability to switch the tail, the animal being unable to offer any resistance if the tail is bent up over the croup. These symptoms may remain with but little change for two or three days, when a gradual improvement may take place, or the reverse may occur. The power to swallow may become entirely lost, stupor or coma may supervene, the pulse become slow and weak, the breathing heavy and noisy, and delirium may develop with spasms and contraction or rigidity of the muscles of the back, neck, and jaws, with a fatal termination in six to ten days.

3. In the third grade, or mildest type of the disease, partial paralysis or loss of perfect control over the limbs, loss of power over the tail, and some difficulty in swallowing are manifested, with some congestion of the mucous membranes of the eyes and nostrils. In other cases there may be paralysis of one or more limbs, but the animal has no fever, pain, or unconscious movements, and may begin about the fourth day to improve and go on to recovery. Not infrequently transverse paralysis (paraplegia), or loss of power of the hind extremities, is a prominent symptom. The absence of coma for one week is a favorable sign, and in such cases with proper care and treatment recovery is usual, though evidences of paralysis may remain for some time. One attack does not protect the animal against a subsequent attack, as horses have been known to have the disease two or three times.

TREATMENT.

First, the animals should be removed to a clean, dry, and airy, or well-ventilated building, and a complete change made in their feed. This is imperative when there is any suggestion of damp, fermentation, or moldiness about the feed; likewise the water must be changed, unless the latter is from a source insuring freedom from pollution. When a considerable area is affected by those conditions which are favorable to fermentation and the production of molds on vegetation, it may be necessary to procure hay, feed, and straw from a distance. Although this may appear an expensive undertaking, it is apt to prove a real economy in the end, as only such grain and forage must be used as are known to be sound and water that is known to be uncontaminated by surface drainage.

Buildings that have been occupied by the horses and mules should be emptied and thoroughly cleaned and disinfected, especial attention being given to drains and low places in stalls, etc. Frequently stables in low sections of the country are built on the level ground, without flooring, and as a result of the stamping of the animals and the removal of litter and bedding the bottoms of the stalls have become sunken below the ground outside, and as a consequence are always wet. The bottoms of such stalls and the entire stable should be kept filled in with dry clay or earth to a higher level than the surrounding ground, and water in such sections should, as far as possible, be provided from driven wells, protected against surface drainage by having the earth slope away in all directions from the pump.

As a disinfectant, liquor cresolis compositus, carbolic acid, or chlorid of lime may be used in 5 per cent solution, made by mixing 6 ounces of liquor cresolis compositus (U. S. P.), carbolic acid, or chlorid of lime with each gallon of water. All floors, drains, etc., should be thoroughly wetted with this solution, and the woodwork of the building then whitewashed with a limewash to which 4 ounces of chlorid of lime or 4 ounces of carbolic acid have been added to each gallon of the whitewash.

MEDICINAL TREATMENT.

In the worst class of cases treatment is not apt to meet with success, as very soon following the onset of the attack convulsions, delirium, or coma supervene, and there is little opportunity for any beneficial effect from the administration of medicines. On account of the inability to swallow, due to a paralysis of the muscles of the throat, attempts to administer medicines are apt to result in a part of the dose, when a drench is forced upon the animal, passing into the windpipe and lungs, and this of itself is a sufficient cause for the production of a fatal pneumonia. It therefore often happens that medicines can only be successfully administered hypodermically. If the animal is seen, however, before inability to swallow becomes a barrier to administering a purgative dose, a ball of aloes may be given. In case of coma or unconsciousness it is possible that a sponge, moistened with ammonia or spirits of hartshorn, carefully held to the nostrils for short intervals, may serve to stimulate and revive the animal sufficiently to admit of the administration of the ball. Further stimulation is also desirable, when practicable, in such cases in the form of alcohol, which should be given in milk to remove its otherwise irritating properties to the throat. Four to 6 ounces of whisky, in 1 to 2 pints of sweet milk, may serve a good purpose, or 2-dram doses of carbonate of ammonia, in the form of a drench, made by dissolving it in 4 ounces of water and adding 4

ounces of molasses, or by pulverizing and mixing the carbonate of ammonia with an equal volume of flour, moistening it sufficiently to make a stiff dough or mass and giving as a ball or bolus, wrapped in a thin tissue-paper covering or inclosed in a gelatin capsule made for the purpose. Physicians are always supplied with hypodermic syringes, and in thinly settled sections, where no veterinarian is available, they might be called upon in such emergencies to administer medicines hypodermically, which in the horse should be injected under the skin on the side of the neck, or under the skin covering the chest or ribs, just back of the elbow.

A purgative is always indicated in the treatment of this disease, and when practicable a ball may be given, consisting of aloes 1 ounce, with which 2 drams of solid extract of belladonna has been incorporated. In the event the animal is unable to swallow, the sole dependence in producing purgation appears to consist in the injection of concentrated medicines under the skin (hypodermically), and these, in fact, when available, frequently answer a much better purpose than medicines given by the mouth, since they are promptly taken up by the blood and are far quicker in their action. A purgative ball or drench given to a horse may not cause purging for twelve to twenty-four hours, whereas a half dram of barium chlorid, injected directly into the juglar vein, or $1\frac{1}{2}$ to 2 grains of eserine, injected under the skin, will usually cause free evacuations of the bowels in fifteen to twenty-five minutes. Other remedies applicable, which would likewise, however, require the services of a veterinarian or physician, either of whom will recognize the indications, are 2-grain doses of strychnia twice or three times a day, which should be discontinued if there is twitching of the muscles of the shoulder or gnashing of the teeth. To stimulate the heart and capillary circulation, when the animal is unable to swallow the drench of whisky or the carbonate of ammonia bolus, quarter-grain doses of atropia may be injected hypodermically every four to six hours, which likewise tends to relieve excitability. Iodid of potassium is also indicated in advanced stages and in convalescence, and may be given in 1 to $1\frac{1}{2}$ dram doses twice daily, to aid in the reabsorption of fluid, this being the suspected cause of the paralytic symptoms, resulting from congestion of the brain and spinal cord and effusion into these organs and their membranes or coverings, which upon post-mortem examination has so often been found to have occurred in fatal cases of this disease.

When evidences of improvement are observable and the animal shows a disposition to eat, give a moderate amount of such good, wholesome feed as he will take, and keep fresh, cold water before him constantly. He should be supported by slings, if at all able to stand with their assistance.

OSTEOPOROSIS OR BIGHEAD OF THE HORSE.

By JOHN R. MOHLER, V. M. D.,

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Osteoporosis is a general disease of the bones which develops slowly and progressively and is characterized by the absorption of the calcareous or compact bony substance and the formation of enlarged, softened, and porous bone. This fragile and deformed condition is particularly manifest in the bones of the head, causing enlargement and bulging of the face and jaws, thereby giving rise to the terms "bighead" and "swelled head" which are applied to it. The disease affects horses, mules, and asses of all ages, classes, breeds, and of both sexes, but is probably more frequently observed in mature horses and Shetland ponies. The disease is found under all soil, food, and climatic conditions. It may occur in sporadic form, but in certain regions, such as South Africa, Hawaii, and in this country, it seems to be enzootic, several cases usually appearing in the same stable or on the same farm, and numerous animals being affected in the same district.

NAMES APPLIED TO THIS DISEASE.

This affection has been commonly termed bighead, swelled head, or bone softening by horsemen, but it is also known under the more elaborate names of osteoclastia, enzootic ostitis, rarefying ostitis, osteomalacia, fragilitis ossium, and osseous cachexia.

HISTORY.

Very little literature has been presented on this disease, which indicates either that limited attention has been given to it, or that it has been confused with other affections. In Europe the disease appears to be quite rare and is usually described as a form of osteomalacia, a disease which is not uncommon among cattle of that Continent. "Bran disease" of European horses, said to be due to an excessive bran diet, is considered as quite a distinct affection. This latter condition can not be differentiated from the "millet disease" of this country, which is in practically all respects similar to bighead. However, the opinion that bighead is only a form of osteomalacia can not be accepted, nor can the infrequency of the former among

horses and the frequency of the latter among other live stock be conceded on the argument that has been presented, namely, that the better care which horses receive prevents them from becoming affected. In the Southwest, where osteomalacia, or creeps, has not infrequently been observed by the writer among range cattle, no case of osteoporosis of the horses using the same range has been noted, although the latter animals receive no more care or attention than the cattle.

The appropriate treatment of osteomalacia in cattle is so well known and so effective that if osteoporosis were a similar manifestation of disease a similar line of treatment should prove equally efficacious. This, however, is not the fact. On the other hand, occurrence of osteomalacia on old, worn-out soil, or land deficient in lime salts, or from eating food lacking in these bone-forming substances, or a lime deficiency in the drinking water, is in perfect accord with our knowledge of the disease. But osteoporosis may occur on rich, fertile soil, in the best hygienic stables, and in animals receiving the best of care and of bone-forming foods with a proper amount of mineral salts in the drinking water. Bighead probably occurs more frequently in this country than in Europe, and in certain sections appears in an enzootic form, as it does in Australia, South Africa, India, Madagascar, Hawaii, and the Philippines. In some of these outbreaks in this country that have come under observation the cattle and sheep that have been fed the same hay and grain and stabled in the same barn have not shown the least evidence of osteomalacia. For these reasons osteoporosis is considered as a complete entity entirely independent of osteomalacia.

The disease has been found in this country in all the States bordering the Delaware River and Chesapeake Bay, in the District of Columbia, in some of the New England States, and in many of the Southern States, especially along the coast and in regions of low altitude.

CAUSE.

The cause of this disease still remains obscure, although various theories have been advanced, some entirely erroneous, others more or less plausible, but none of these has been established. Thus faulty feed has been a favorite explanation, but the idea that feeding fodder and cereals poor in mineral salts and grazing in pastures where the soil is poor in lime and phosphates will cause the disease has been easily disproved in many instances. This cause is accepted for osteomalacia in cattle, but not for osteoporosis in horses, since the latter disease is seen on limestone soils, as in New York State, and in animals generously fed on grain and those which are well fed and in good condition, as in many cases in Philadelphia and Washington. Some



FIG. 1.—HEAD OF OSTEOPOROTIC HORSE, WITH SWELLING AND DEFORMITY OF FACIAL BONES.

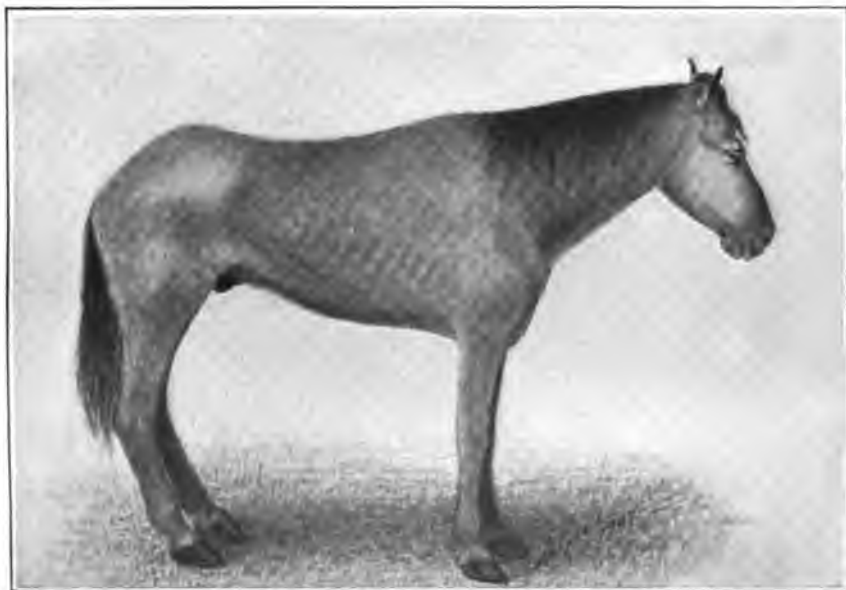


FIG. 2.—OSTEOPOROTIC HORSE.

[Showing enlargement of bones of the head, dropping of the croup, "tucked up" abdomen, and the peculiar position simulating founder.]

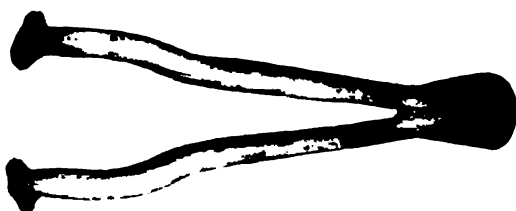


FIG. 1.—LOWER JAWBONE OF A NORMAL HORSE (UNDER VIEW).



FIG. 2.—LOWER JAWBONE OF AN OSTEOPOROTIC HORSE (UNDER VIEW).

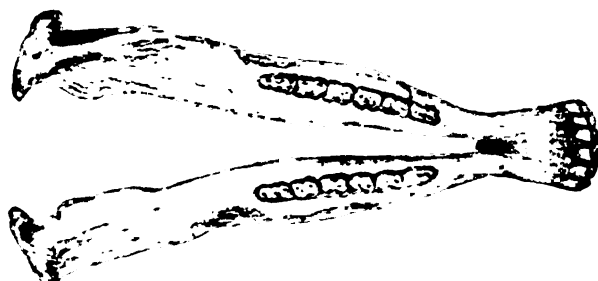


FIG. 3.—UPPER VIEW OF THE BONE SHOWN IN FIG. 2.

[Note the marked irregularity and enlargement of the bones of the diseased jaw.]

veterinarians have considered that the disease started as a muscular rheumatism followed by an inflammatory condition of the bones, terminating in osteoporosis, while others have thought it was due to forced or high feeding.

The idea that the disease is contagious has been advanced by many writers, although no causative agent has been isolated. Numerous experiments have been made by inoculating the blood of an affected horse into normal horses, but without results. Also a piece of bone taken by Pearson from a diseased lower jaw of a colt was transplanted into a cavity made for it in the jaw of a normal horse, but without reproducing the disease. Prétone believes that the *Micrococcus nitrificans* causes osteomalacia in man as a result of its producing nitrous acid which absorbs the calcareous tissues. When injected into dogs in pure culture a similar disease is produced. It is probable that if this work is confirmed a similar causative factor will be discovered for osteoporosis.

Elliott considers the disease to be a microbic affection due to climatic conditions, and divides the island of Hawaii into two districts, in one of which the rainfall is 150 inches annually and bighead is very prevalent, while in the other, which is dry and rarely visited by rain, the disease is unknown. Removal of animals from the wet to the dry district is followed by immediate improvement and frequent recovery. In the wet district horses in both good and bad stables take the disease, but in the dry district no unfavorable or unhygienic surroundings produce the affection. As both native and imported horses are equally susceptible, there is no indication of an acquired immunity.

If bighead is a microbic affection—and it certainly has many of the characteristics of an infectious disease—it is probable that the cause is a nitrifying organism which prevents the proper assimilation of the nutrient salts, even though these ingredients are contained in the proper proportion in the food; or these organisms may act directly on the nerves nourishing the bony structures, as the rabies or tetanus virus does on the central nervous system. Theiler has recently stated that his experiments in transfusing blood were negative, and suggests that the cause may only be transmitted by an intermediate host, as in the case of Texas fever. He draws attention to this method of spreading East African coast fever, although blood inoculations are always without result. We know coast fever is infectious, that it can not be transmitted by blood inoculations, but that it occurs with remarkable ease through ticks coming from diseased cattle. That the cause of osteoporosis has not been observed may be accounted for by its being invisible even to the high powers of the microscope.

On some farms and in some stables bighead is quite prevalent, several cases following one after another. On one farm of thoroughbreds in Pennsylvania all the yearling colts and some of the aged horses were affected during one year, and on a similar farm in Virginia a large proportion of the foals for several years were diseased, although the cows of this farm remained unaffected.

SYMPTOMS.

The commencement of the disease is usually unobserved by the owner, and those symptoms which do develop are generally not well marked, or may be misleading unless other cases have appeared in the vicinity. Until the bones become enlarged the symptoms remain so vague as not to be readily diagnosed. The disease may present itself under a variety of symptoms. If the bones of the hock become affected early in the disease, the animal will first show a hock lameness. If the long bones are involved first, symptoms of rheumatism will be observed, while if the dorsal or lumbar vertebræ are affected indications of a strain of the lumbar region are in evidence.

Probably the first symptom to be noticed is a loss of vitality combined with an irregular appetite or other digestive disturbance and a tendency to stumble while in action. Poor mastication of food resulting from the early changes in the jawbones may direct attention to the teeth, and a futile attempt is sometimes made to relieve this condition by "floating" the teeth. However, these earlier symptoms may pass unobserved, and the appearance of an intermittent or migratory lameness without any visible lesion to account for it may be the first sign to attract attention. This shifting and indefinite lameness, involving first one leg and then the other, is very suggestive, and is even more important when it is associated with a tendency to lie down frequently in the stall and the absence of a desire to get up or the presence of evident pain, stiffness, and difficulty in arising.

About this time, or probably before, swelling of the bones of the face and jaw, which is almost constantly present in this disease, will be observed. (See Pl. XX, fig. 1.) The bones of the lower jaw are the most frequently involved, and this condition is readily detected with the fingers by the bulging ridge of the bone outside and along the lower edge of the molar teeth. A thickening of the lower jawbone may likewise be identified by feeling on both sides of the lower border of the jaw and comparing it with the thinness of this bone in a normal horse. (See Pl. XXI.) As a result mastication becomes difficult or impossible and the teeth become loose and painful. The imperfect chewing which follows causes balls of food to form which drop out of the mouth into the manger. Similar enlargements of the bones of the upper jaw may be seen, causing a widening of the

face and a bulging of the bones about midway between the eyes and the nostrils. The nasal bones also become swollen and deformed, which, together with the bulging of the bones under the eyes, give a good illustration of the reason for the application of the term "big-head." Other bones of the body will undergo similar changes, but these changes are not so readily noted except by the symptoms they occasion. The alteration of the bones of the spinal column and the limbs, while difficult of observation, is nevertheless indicated by the reluctance of the animal to get up and the desire to remain lying for long periods of time. The animal easily tires, moves less rapidly, and if urged to go faster may have a ligament torn from its bony attachments, or sustain a fracture, especially of the long bones of the leg. An affected horse weighing 1,000 pounds was seen by the writer to fracture its first phalanx from rearing during halter exercise.

The animal becomes poor in flesh, the coat is rough and lusterless, the skin tight and harsh, producing a condition termed "hidebound," with considerable "tucking up" of the abdomen. The horse shows a short, stilted, choppy gait which later becomes stiffer and more restricted, while on standing a position simulating that in founder is assumed, with a noticeable drop to the croup. (See Pl. XX, fig. 2.) The animal at this stage usually lies down and remains recumbent for several days at a time. Bedsores frequently appear, and fractures are not uncommon as a result of attempts to arise, which complications in addition to emaciation result in death. The disease may exist in this manner for variable periods, extending from two or three months to two years.

LESIONS.

As has been stated, the bone is the principal tissue involved. The nutrition of the bone is disturbed, as is indicated by the diminished density or rarefaction of the bony substance, the increase in the size or widening of the Haversian canal and the medulary cavity, and the enlargement of the network of spaces in the spongy tissue, the absorptive changes following the course of the Haversian system. In this process of absorption there are formed, within the substance of the bone, areas of erosion, indentations, or hollow spaces of irregular shape. These spaces increase in size and become confluent, causing a honeycombed appearance and an irregular thickening and enlargement of the bone. When fractures occur, no callus forms, but if the ends are left free they rub together and become smooth. The articular and intervertebral cartilages at times become eroded and may disappear, while occasionally either true or false ankylosis takes place. The affected bone may readily be incised with a knife, and the cut surface appears finely porous, resembling some varieties of coral. This porous area is soft, pliable, and yields easily to the pressure of

the finger. It has been shown by chemical analysis that the bone of an osteoporotic horse when compared with that of a normal horse shows a reduction in the amount of fat, phosphoric acid, lime, and soda, but a slight increase in organic matter and silicic acid. The bones lose their yellowish-white appearance, becoming gray and brittle. The affected bones may be those of any region or portion of the body, or of the long, short, or middle class of bones. Besides the changes already noted in the bones of the face, the ends of the long bones, such as the ribs, are involved and may be sectioned, though not so readily as the facial bones. The bones of the vertebræ are also frequently involved, necessitating great care in casting a horse, as the writer has seen several cases of broken backs in casting such animals for other operations. The marrow and cancellated tissue of the long bones may contain blood extravasations and soft gelatinous material or coagulated fibrin. Internal organs are usually normal, but a catarrhal condition of the gastro-intestinal tract may be noted as a result of the improper mastication, resulting from the enlargement of the jaws and soreness of the teeth.

DIAGNOSIS.

The recognition of bighead after the disease has fully developed is not difficult, but in the early stages, when the symptoms are variable and obscure, it is probably frequently mistaken for muscular or articular rheumatism, which is more likely to attack the upper joints of the legs and is found associated with fever.

PROGNOSIS.

The prognosis is uncertain at best, but is more likely to be favorable if treatment and an entire change of feed, water, and location are adopted in the early stages of the disease.

TREATMENT.

The affected animal should be immediately placed under entirely new conditions both as to feed and surroundings. If the horse has been stable fed, it is advisable to turn it out on grass for two or three months, preferably in a higher altitude. If the disease has been contracted while running on pasture, place the animal in a stable or corral in a different locality. In the early stages of the disease beneficial results have followed the supplemental use of lime given in the drinking water. One peck of lime slaked in a cask of water and additional water added from time to time is satisfactory and can be provided at slight expense. This treatment may be supplemented by giving a tablespoonful of powdered bone meal in each feed, with

free access to a large piece of rock salt; or the bone meal may be given with four tablespoonfuls of molasses mixed with the feed. Crude calcium phosphate in 2-dram doses three times daily may prove beneficial. Pure phosphorus may also be given in $\frac{1}{4}$ -grain doses three times daily in the form of pills in cacao butter. The bowels of the animal should be kept loose, and overloading of the gastrointestinal tract should be carefully guarded against at all times. Foods containing mineral salts, such as beans, cowpeas, oats, and cotton-seed meal, may prove beneficial in replenishing the bony substance that is being absorbed. The latter is one of the best feeds for this purpose, but it should be fed carefully. In addition to liberal feeding on sound and nutritious grain, supply the best hygienic conditions obtainable, avoiding low, damp pastures as well as basement or damp stables. The animal should not be allowed to work at all during the active stage of the disease, nor should it be used for breeding purposes.

SOME OBSERVATIONS ON RABIES.

By E. C. SCHROEDER, M. D. V.,

Superintendent of Experiment Station.

THE REALITY OF THE DISEASE.

The disease commonly known by the names of rabies, hydrophobia, lyssa, canine madness, etc., is strictly one of the easily preventable diseases. Its communication from subject to subject depends upon actual inoculation, and its persistence among dogs and its frequent transmission to other animals and to persons are conditions directly traceable to the absence of regulations of a kind commonly enforced for the suppression of other infectious diseases. The failure to adopt reasonable measures probably rests largely on a misconception of the frequency with which rabies occurs and to a great extent on a false sentiment against subjecting dogs to proper restraint.

While there is no desire to enter into the still active controversy regarding the existence or nonexistence of the infectious disease that has been repeatedly described under the name of rabies or one of its synonyms, this side of the subject can not be ignored.

It is something of a mystery why a greater diversity of opinions should be held about rabies than about other infectious diseases. Its occurrence, nature, symptoms, mode of communication, etc., are facts of observation and investigation that have an evidential value fully as strong as the best reasons that can be given for our belief in the existence of diseases like smallpox, scarlet fever, measles, etc.

Many lovers of the dog, who regard him as man's best friend among animals, seem to believe that it is an unjust charge against his admirable character to acknowledge that he may suffer with rabies. Their view is unreasonable, as the susceptibility of an animal to disease has no connection with its moral nature or character, and we can not obliterate or modify facts by refusing to accept them; but, if a dangerous condition exists, we may greatly increase the amount of suffering it causes by denying and ignoring it and permitting it to operate without restraint. To admit the truth about rabies may mean that we accept a fact the existence of which is antipodal to our wishes and contrary to our sense of justice, but it is no more a criticism against the commendable attributes of the dog, through which he holds our affections, than it is an adverse criticism of man

to assert that he may become affected with any one or more of a number of diseases through which he, as an individual, quite independent of his moral personality, becomes a menace to the welfare of his immediate associates and indirectly to the entire community. The dog has virtues enough to hold his place in our esteem in spite of the fact that he may be the victim of rabies and do great harm while he is affected with this horrible disease, which deprives its subjects of all moral responsibility before the desperate agony it causes ends in death.

THE EXISTENCE OF RABIES ESTABLISHED BY IMPARTIAL INVESTIGATION.

A deliberate denial of the existence of rabies means one of two things—either a lack of information or an impeachment of the honesty of innumerable impartial observers and investigators. Those whose denial is based on lack of information, if they are at all open to conviction, will change their minds after examining what has been written on the subject by men who are above the reproach of an attempt to malign the canine species. To those who have never seen rabies and for that reason can not be convinced of its existence it can only be said that not to be acquainted with a thing through personal experience, not to have seen or encountered it, not to have knowledge of it through our senses, means nothing but inexperience relative to the thing in question. The writer has never seen a case of smallpox or Asiatic cholera, and yet they are, unfortunately, common diseases. He has not seen the Asiatic continent, but that does not reduce its great area by the smallest fraction of an inch or its enormous population by one person.

A general impeachment of the honesty of the many writers who have recorded their observations of rabies approaches a libel on human nature such as it is sincerely hoped no facts will ever give the semblance of truth. The moral side of man has its defects, but it is not corrupted by a widespread degradation that can lead thousands of otherwise honorable, truthful men, among whom must be included many famous, clear-visioned benefactors of mankind, to deliberately falsify truth for no better purpose than a supposed pleasure that is to be derived from falsification or, at best, an attempt to malign a species of animals. The animosity that some persons may feel toward the canine tribe may be sufficient to account for a too ready acceptance of what they believe is derogatory to it, but among the writers on rabies who have information at first hand are many lovers of dogs, who are willing and ready to defend the dog with sturdy energy against all enemies, and who believe that the worst enemy against which he must be defended is the desperate agony of the fatal, infectious disease now under consideration.

FALLACY OF THE IMAGINATION THEORY.

There are persons who admit the existence of an affection that frequently follows injuries inflicted by the teeth of a dog, but they say that it has nothing to do with an infectious agent. The disease is alleged to be caused by an overwrought imagination that dwells with extreme, morbid intensity on a greatly feared but wholly fictitious danger. To those who hold this belief it must be apparent, even if it is admitted that an adult person may be found occasionally with a sufficiently active imagination to give it the least validity, that children and the lower animals never possess the necessary power of abstract concentration to induce through its exercise or the exercise of any faculty of the mind an acute, rapidly fatal, nervous affection. Hence this belief, which suggests an abstract process that leads to a concrete, unintentional suicide or self-destruction, does not explain the occurrence of rabies among children and animals, and especially not among the latter.

If there is one place where a sharp line can be drawn between man and the whole known world of organisms subordinate to him, it is in connection with this matter of abstract thought. Man alone has the intellectual endowment for abstract thought. Animals, and children during the first years of their lives, if they think at all, confine their thoughts to the contemplation of concrete objects and their concrete attributes. Imaginary dangers, fictitious evils, and abstract apprehensions will not reduce the health or endanger the life of a horse, a cow, a sheep, a dog, or of a child until it has learned to express its thoughts in language.

One of the tests of the validity of a theory is to determine its compatibility with all the known facts for which it is devised to offer an explanation. The imagination or apprehension theory, as it may be called, to supply an explanation for the peculiar, fatal, nervous disease that is meant when the name rabies is used, is insufficient to account for the disease in anything but some human beings who have passed the years of early childhood. This alone is a fatal objection to it, to say nothing of the fact that it is altogether too complex to serve as a reasonable explanation for any manifestation of nature. Nature, wherever we know her, is simple and direct. The multiplication of a living virus in the body of an animal, the communication of this virus directly or indirectly by the affected animal to another animal, the multiplication of the virus in and the consequent affection of the second animal, are processes that have been demonstrated to occur with most infectious diseases in man and animals, and this is the simplest conceivable explanation of what infection is and how contagion is effected.

Here, of course, the question will be asked, "When did the first case of rabies originate, if it is the result of a living virus that grows in the body of a person or animal and every case supposes the previous existence of an earlier case?" The answer to this question is a mystery that is buried in the primary causes of things. The same question may be asked with equal right about every living organism in the universe. Each cornstalk requires the existence of a previous cornstalk that produced fertile seed, and each weed an earlier weed of a similar kind; and this is true of every animal and plant in the whole category of living things, from the highest mammal to the lowest microzoon, from the largest tree to the most minute bacterium. To deny the existence of rabies because we can not trace the virus to its primary origin is to use an argument that can be applied with equal justice to show the nonexistence of both the dog and his master and everything else living and dead. Primary, fundamental, or final causes are beyond human comprehension, and those persons who require them as a basis for their beliefs, if they are consistent, must necessarily deny the existence of everything.

THE FREQUENCY AND DISTRIBUTION OF RABIES.

Relative to the frequency with which rabies occurs and the broad territory over which it is disseminated, many carefully compiled statistics from medical journals could be quoted, but it is not necessary for our purpose to do so, as the daily newspapers supply abundant material. The Chicago Chronicle of September 22, 1906, states that rabies prevailed during the year in the following States: Massachusetts, Ohio, the Dakotas, New York, Michigan, Connecticut, Indiana, New Jersey, Kentucky, Pennsylvania, Delaware, Illinois, and Rhode Island. To this may be added cases that came to the writer's personal notice from Maryland, Virginia, the District of Columbia, and North Carolina.

During three weeks of the month of January, 1907—a season of the year when rabies is supposed by many to be least prevalent—there appeared in the daily papers of Washington, D. C., no less than twelve items dealing with cases of rabies or hydrophobia in the eastern section of the United States. According to these reports at least nine persons had died recently as a result of the bites of rabid animals, and scores of people had been bitten.

At Norfolk, Va., a huge hound bit nine persons while it was suffering from rabies. Four of the persons—two policemen and two little children about 4 years old—were terribly bitten. Six of the victims were children ranging in age from 4 to 11 years. The body of the dog was examined in the Pathological Laboratory of this Bureau, and the animal was pronounced to have been affected with genuine rabies.

One stops to think with horror of the apprehensive agony of the parents of these children, the suffering to which parents and children are subjected while treatment is being applied to prevent the development of the terrible disease, to say nothing of the expense of treatment, which for most people is an extreme hardship. Fortunately in this case the cost of the treatment for the persons who were bitten—\$1,200—was raised by public subscription. The very idea of an injury to the tender, soft skin of a child can not be entertained by a normal mind without causing a shudder. It is to children first of all that our love and protection should be given, both against physical suffering and the greater agony that comes with the terror they endure when they are attacked by something against which they realize their impotence to defend themselves.

Of two deaths from rabies recently reported, one was that of a coachman who was infected by the caresses on his face of his pet dog that a few days later developed rabies, and the other of a child that showed no marks of having been bitten. Attention was called by the press to the danger of infection through any form of wound or abraded skin which becomes contaminated with rabic virus. The possibility of such infection through a wound is borne out by the fact that the inoculation of the virus into any portion of the body of experiment animals produces the disease. Injection of the fragments of the brain from a dog that has died of rabies under the skin or into the muscle of a rabbit produces typical, fatal rabies, often as rapidly as an injection into the brain. There is a marked relationship, however, between the rapidity with which the disease develops and the proximity of the point of inoculation to the brain. Wounds inflicted by rabid dogs about the head and neck are more rapidly fatal than those on the extremities, the legs or arms, or the lower portions of the body.

If it lies in the character of the dog to run amuck quite frequently or only occasionally, with no cause like rabies to explain his frenzy, we must regard him as having profited too little from his long domestication and association with man to enjoy special liberties and a freedom from restraint that no sane person claims for or wishes to bestow on horses, sheep, swine, or other species of animals. This running amuck, as it implies an inherent and incurable defect of character of an exceedingly objectionable kind, would constitute a more serious charge against the moral nature of the dog, if it were true, than rabies. Rabies is a disease that can be stamped out entirely by adopting and enforcing proper measures against it. An inherent characteristic is a totally different matter, which would be as difficult to eliminate or eradicate as the tendency of dogs to bark.

TWO CASES IN HORSES AT THE EXPERIMENT STATION.

The case of a horse which died of rabies at the Bureau Experiment Station in the fall of 1906 presents a striking illustration of the terrible nature of the disease. On September 14, 1906, a small, bay mare, a tractable, intelligent animal, in good physical condition, somewhat advanced in age, was brought to the station by her owner to be kept in confinement and under observation because she had been bitten by a dog. The Pathological Division of the Bureau examined the dog and determined that it was affected with rabies. The mare was bitten on the right side of the face a few inches above the angle of the lips; the injury was clearly visible as a group of small scars. Shortly after the wound was received it was treated by a veterinary surgeon.

At the station the mare was placed in a large, well lighted and ventilated box stall, in which she was allowed to move about at will, untied. She remained well as far as could be determined from her appearance and conduct until September 27, when she failed to eat her evening meal, neighed a great deal, and seemed to be nervous and restless. On the following day, September 28, beginning at 8 a. m., she showed what may be regarded as the unmistakable symptoms of violent rabies. The symptoms observed and recorded are practically identical with those shown by a horse that became affected with rabies at the station in the year 1900 as the result of a bite inflicted by a rabid dog.

The preliminary symptoms were restlessness, nervousness, and loss of appetite. The mare was easily startled by sounds to which she was accustomed and did not ordinarily notice. These symptoms may be important in connection with horses that are known or suspected to have been bitten by rabid dogs and are retained in service or not properly confined to prevent them from harming persons and animals.

Beginning from twelve to twenty-four hours after the above symptoms, at 8 a. m. the mare was restless, her lips quivered, and there was some froth about her mouth. At 9 a. m. she was more restless, her face had an anxious expression, the froth about her mouth had increased, and she pawed the earth floor of the stall incessantly. At 10 a. m. practically no change was observed. At 11 a. m. in addition to the froth at her mouth a thick, viscid saliva fell in drops from her lips, her mouth was in constant motion, her tongue was protruded and drawn back repeatedly with a rapid movement, first to one side, then straight out, then to the other side, somewhat more frequently to the side on which her face had been bitten; her head was swung violently up and down and from side to side; the muscles of her back were tense and those of her mouth, lips, chest, and shoulders twitched frequently. Although she was not observed to

have made an attempt to bite during the two weeks she was at the station previous to the development of rabies and was said by her owner always to have been gentle and quiet, she now plunged viciously at every person who approached the stall, with her ears depressed and lips drawn back so far as to expose the full length of her front teeth and gums. She snapped frequently at the sides of the stall and seemingly at imaginary objects; her teeth came together with a sharp sound like the click of a steel trap. At 11.10 a. m. she passed urine. When her tail was accidentally touched she kicked viciously and repeatedly. These symptoms continued without noticeable change until 1 p. m., when she began to snap and paw more frequently and to bite her shoulders and legs. Her saliva was now thinner, less viscid, and flowed more freely, and was occasionally, when she moved her head violently, sprayed in a shower of drops to a distance of several feet. At 2 p. m. she struck with her front feet at the sides of the stall, threw herself, and regained her feet in a few minutes. At 2.30 p. m. she made frequent unsuccessful attempts to pass feces. At 3 p. m. lay down, tried to roll, got up, and passed a small ball of feces coated with thick, creamy mucus. At 3.15 p. m. passed urine of a strong, pungent odor; made frequent attempts to lie down, but remained on her feet. At 4 p. m. lay down and immediately began to bite her forelegs viciously; five minutes later was up again and some blood flowed from her mouth, due to self-inflicted injuries of her lips and tongue. Every muscle of her body twitched and quivered, and her respiration was greatly accelerated. At 4.15 p. m. seized her foreleg so violently with her teeth that she threw herself; viciously bit her now bleeding legs and shoulders over and over again; attempted to roll and thrashed her head against the floor of the stall; her eyes had a set, glassy appearance. At 4.30 p. m. she was still down, made no attempt to get up, but passed through all the motions with her legs and body, alternately, of very rapid trotting and violent running. She became comatose at 4.40 and died at 5.13 p. m.

The autopsy record is as follows: The meninges of the brain are greatly congested. The right shoulder shows numerous small tears and cuts in the skin; under these the tissues are contused and infiltrated with blood and serum. The right leg shows numerous abrasions. On the inner surface of the right forearm a hole an inch in diameter has been torn through the skin; under this the periosteum is partly stripped from the bone and the latter shows tooth marks and scratches. The tongue, lips, and face show numerous cuts and bruises. The injuries were self-inflicted during paroxysms of agony and fury. The wound in the face, made by the rabid dog, was completely healed, but there was some congestion in the tissues where it was located. No other lesions of disease were found.

In one respect the symptoms in the mare differed from those of the horse referred to as having died in the year 1900. The latter perspired profusely and its entire body was as wet as though it had been dipped in water, while the body of the mare remained dry. In both cases the animals were harrowing objects. The combined and cumulative suffering of many dogs through continuous proper muzzling would be extremely mild in comparison.

The description is a weak attempt to represent the agony visibly suffered during eight long hours on the day the mare died. The conditions were unfortunately such that the poor animal could not be killed at once to end her agony, and to approach a horse while it is suffering with the violent paroxysms of rabies to apply alleviative treatment would be suicidal for the strongest man. Her violence made it impossible to obtain records of her temperature and pulse or to make other observations that require tactual examination. A pail of water in the manger of the stall was emptied several times. This could be and was refilled by pouring into it from the top of the stall partition. Whether the water was actually swallowed or only splashed out is uncertain, but she plunged her muzzle into it again and again, as though she was very thirsty and wanted to drink. There was no fear of the water. Her throat in the region of the larynx gave the impression of unusual prominence, but here again, because she could not be approached without great danger, no thorough examination could be made; but it is probable that the prominence was due to an extreme spasmodic contraction of the muscles of the larynx and pharynx.

The fury with which the poor beast plunged, bit, kicked, pawed, and thrashed about, and the terrible picture of suffering and violence she presented may be judged to some extent from the fact that men who are experienced in the care and management of large animals, and whose courage for handling unruly horses and cattle has been proved repeatedly in practice, actually approached her dead body with reluctance and uneasiness, and confessed that they would not have entered the stall before the mare died, under any consideration, however profitable.

The mare was bitten on September 3; was brought to the experiment station eleven days later, on September 14; showed the first symptoms of rabies on September 27, or thirteen days after her arrival at the station and twenty-four days after she was bitten, and died one day after the first symptoms were observed. The time that elapsed between the bite of the dog and the death of the horse that contracted rabies in the year 1900 was somewhat longer. The horse was bitten on April 27 and died June 5, or after an interval of thirty-nine days.

For those who doubt the existence of rabies, or believe that it is a

disease induced by the fear of an impending evil, the cases of these two horses offer food for reflection.

The number of horses kept at the experiment station at any one time during the last ten years varies from 10 to 40, and averages about 20. The total number of different horses that have been at the station during the last ten years, for periods of time varying from three months to ten years, is not less than 100. Among these only two are positively known to have been bitten by dogs that showed symptoms of rabies, and only these two horses contracted rabies. If there is no relation between the bites of the dogs and the affection of the horses, we have here a very remarkable coincidence. Lyssa-phobia, or the dread of lyssa or rabies, as has already been pointed out, can not serve as an explanation with horses. There is and was nothing in the stalls or the stables occupied by the horses to account for their affection. Other horses occupied the same stables and the same stalls both before and after the two that died of rabies. The others had not been bitten by rabid dogs, and they remained perfectly well and nothing resembling rabies happened to them. Horses kept under precisely the same conditions as those that died of rabies for much longer periods of time also remained well. There is only one rational explanation, and it is this—that rabies is an infectious disease that is communicated from animal to animal or from animal to person by a bite or some other injury into which the virus of rabies is introduced.

INSTANCES OF DANGER FROM RABID DOGS.

The dog that bit the horse that died in the year 1900 afforded an example of the extent to which persons and animals over a large territory may be exposed to danger through a single rabid dog. He escaped from the yard of his owner in Washington, D. C., early in the forenoon and was killed by a blacksmith, whose dogs he viciously attacked, about 7 miles from the city, early in the afternoon. His weight was about 50 pounds. During the few hours he was at large he passed along a mile of city streets and through three suburban settlements, one of which is located fully a mile from the direct road between his point of escape and the place where he was killed. He is known to have attacked four persons, two horses, several cattle, and seven or eight dogs. The persons and cattle fortunately escaped injury; the one horse contracted rabies and the other was accidentally killed by an electric car shortly after it was bitten, and the dogs were killed as a precautionary measure. If the persons attacked had been children and not resolute adults it is questionable whether they would have escaped. The dog passed directly by one public school and attacked two persons, a man and his sister, within a hundred yards of a second public school. At the time of his passage the

children were within doors; had they been on their way to or from school, or out at recess, what might have happened is not pleasant to contemplate. He probably would have done more damage than the dog reported from Norfolk, Va., as having injured six children and three adults. Had the blacksmith who killed the dog failed to do so, it is difficult to say how much farther he would have gone or how much more damage he would have done.

Among my notes on rabies is the record of a large foxhound, a very valuable animal with a championship record for speed, that reads as follows: April 18, was not well in the morning, extremely restless and nervous, did not seem able to find a comfortable position; feverish, thirsty, got into a small stream of water several times as if to cool himself. At 4 p. m. the same day the dog disappeared and returned home at 6 a. m. April 20. After his return he was still restless and showed symptoms of paralysis about his lower jaw, his vision seemed to be affected, and he was unable to swallow milk or water, although he tried to do so. Succeeded in swallowing some solid food. The inability to swallow liquids while the ability to swallow solids remained is a very characteristic symptom of rabies.

The dog died on April 23. On post-mortem examination the body showed numerous comparatively fresh scars of the kind received by dogs when they fight with each other. The organs, as is usually the case with rabies, showed no sufficient lesions to account for the sickness and death. Four rabbits that were inoculated with a minute amount of an emulsion made by crushing a piece of the spinal marrow in sterile water died, one on May 8, two on May 10, and one on May 11, affected with typical paralytic rabies.

This dog, a large, speedy hound, was at liberty during thirty-six hours while he was affected with the active or furious form of rabies. The scars on his body showed that he had met and fought other dogs. All this occurred in a thinly settled county, but it shows how long a rabid dog may remain at large and roam before the paralysis that commonly precedes death from rabies makes him harmless. During the year following the death of the rabid foxhound quite a number of dogs contracted rabies in the territory over which he roamed.

It is truly marvelous that the amount of injury suffered by children through the vicious fury of rabid dogs is not greater; probably their safety is due to the instinctive fear they have for strange dogs and their consequent tendency to seek a place of safety the moment a dog of unfriendly appearance attempts to approach them.

WHY DOGS ARE THE PRINCIPAL SOURCE OF THE CONTAGION.

The intimate association in our minds of dogs and rabies does not necessarily imply a greater susceptibility of dogs than other animals to the disease. The dog is not the only animal that can communicate

rabies by a bite. The bite of a rabid horse, cat, or person is just as dangerous as that of a rabid dog; but it is only dogs and cats that are given an amount of liberty that makes them specially dangerous. No other animals, excepting possibly poultry and pigeons, are allowed to be at large in the same way unattended and unrestrained.

The dog is more dangerous than the cat because he is a social and the cat a solitary animal; that is, the canine family in its native state lives in packs and each individual craves association with other individuals of its kind, while the members of the feline family in their native state are solitary hunters and care nothing about society beyond the association of the sexes for purposes of procreation. The movements of cats are confined to hunting food and the search of the male for the female. The dog must have companions and is restless and unhappy without them. Social life of animals means many battles for the leadership of the pack or herd. The dog often fights instinctively for the glory of leadership and is naturally more pugnacious than the cat, which fights only in self-defense or to obtain some material benefit, either food or a mate or a preferred lair or shelter. Social animals as a rule range over a more extensive territory than solitary animals; it is absolutely necessary that they should do so in order to obtain a sufficient amount of food, as more food is required to feed a pack or herd than an individual or at most a pair. Everyone who has observed both dogs and cats knows of the greater tendency of the former to roam; it runs in their blood; it has been transmitted to them by their early ancestors. When dogs meet they greet each other; when cats meet, unless there is some material reason for a contrary action, they pass each other. Society means more opportunities for both concord and discord than solitude presents.

As rabies may be transmitted by a bite as early as six days before the symptoms of the disease manifest themselves, it is not difficult to see why the hereditary social desire, which brings with it frequent opportunities to fight, and the pugnacity required to gratify the instinct for leadership, should give the dog a position very different from that of the cat relative to rabies. If the cat was also a social animal, its superior agility, its ability to climb over obstructions and walk along narrow, elevated passages and ledges that are inaccessible to dogs, would long since have made it the more serious menace.

RAPID DIAGNOSIS BY MEANS OF SO-CALLED NEGRI BODIES.

Until the year 1903, when the investigator Negri discovered small bodies, which were named after him, in the protoplasm of the nerve cells of rabid animals, which occurred neither in health nor in the presence of other diseases, the post-mortem examination of persons

and animals that succumbed to rabies gave only vague results. As with many other diseases of the nervous system, nothing truly characteristic could be found. It was necessary to base the diagnosis on the history, the symptoms, and the general conditions presented by each individual case, or to wait for the development of an inoculation test, in which a small animal, usually a rabbit, was used. Such inoculation tests sometimes required the passage of only ten or twelve days, usually as long as three weeks, and not rarely longer than a month.

Since the bodies of Negri were discovered it has become possible to make an absolute diagnosis of rabies within a few hours. These bodies have been found in 96 to 98 per cent of all cases of rabies that have been examined, and are so permanent that their presence can be demonstrated some time after decomposition of the tissues in which they are located has begun. Whether the bodies are the micro-parasites of rabies or a product of the disease has not been determined, but we have in them a positive factor that distinguishes rabies from all other known diseases, as well as from all normal conditions. The practical importance of this discovery, apart from its definite pathological significance, is well illustrated by the following occurrence:

A number of years ago a local physician informed me by telephone that he had under treatment an elderly woman because she had been severely bitten by her pet dog, which had suddenly and without apparent cause become so surly, morose, and irritable that it was necessary to kill it. I told the physician to send the dog's body to me so that I could obtain material from it to make a test inoculation for rabies. The body was sent, and I took out the brain and used small portions of it to inoculate two rabbits. The rabbits became affected with typical rabies and died on the seventeenth day after inoculation. When I called up the physician to inform him that the diagnosis of rabies was complete and to advise him to send his patient to a Pasteur institute for treatment as soon as possible, he told me in a very irascible manner that he did not need my information and that his patient was beyond Pasteur and all other treatment; that she had died of rabies four days earlier than my test rabbits, and that she had suffered agonies such as he hoped never to witness again.

The woman died on the thirteenth or fourteenth day after she was bitten; the bites were inflicted on her face, neck, and arms. Had the bodies of Negri been known then as they are known now, it could have been determined on the same day the dog was killed that he was affected with rabies, and his mistress would have resorted to Pasteur treatment without loss of time and would thus have escaped a terrible death.

A case like the foregoing is not unique or singular. The literature on rabies contains many that are parallel to it.

MEASURES FOR THE SUPPRESSION OF RABIES.

We now come to the important question, What action can be taken for the suppression of rabies?

Federal regulations have been advocated by many persons, but are not feasible. Rabies can be controlled only by close police surveillance, which, if the United States attempted to practice it, would engender bitter and unending controversies about State rights and would cost an enormous sum of money. The disease rarely assumes the form of an epidemic, and when it does so the most the Federal Government can do is to quarantine the State in which this occurs for the protection of the other States. Hence the adoption of regulations for the control of rabies must remain a matter for local action and be governed by locally prevailing conditions.

In all regulations the dog must receive first consideration, because he is, through a combination of his frequently pugnacious disposition, his social instinct, his tendency to range over a considerable area, and the great freedom given him to move about everywhere with little or no restraint, the main factor in the persistence and dissemination of rabies.

I have already made the statement that no one will claim for other domestic animals the same freedom from restraint that is commonly granted to the dog. If dogs were treated like horses, for example, both rabies and vagrant dogs would shortly cease to exist. The very freedom accorded to dogs seems to cheapen them in our estimation. In many instances the best reasons that owners can give for allowing their dogs to run at large unattended is that they have no value, and it is usually the least valuable dogs that do the most running.

MUZZLING.

When it is suggested that all dogs should wear muzzles, a great cry is raised against the cruelty of the practice; and yet no one claims that it is cruel to place a bit in a horse's mouth, harness on his body, to fasten him to a wagon or plow or something else to pull, and to allow him to go only where the driver directs without taking into consideration the horse's inclination for direction or to go at all or to stop. It is no more difficult to accustom a dog to a muzzle than to break a horse to harness, and there is nothing cruel about either practice. Under domestication the horse is protected from numerous hardships to which he would be exposed in a wild state and is consequently more contented, and has more reasons for being so, with the relatively few exceptions of abuse to which the humane societies

attend. The harness he wears is the price he pays for an assured shelter and a sufficient and continuous supply of nutritious food.

A dog will of course resent the presence of a muzzle until he becomes accustomed to it, precisely as the horse resents the presence of harness on his body and a bit in his mouth until he has learned to wear them as quietly as most horses do the world over. In some portions of Europe dogs are required to wear muzzles when they are not otherwise restrained from biting, and they do so as naturally and quietly as horses wear harness.

SUGGESTED LAWS.

If laws covering three points could be made and properly enforced, there is no doubt that rabies would soon have no existence but in the history of the past. The features to be embodied in such laws should be as follows:

1. The proper licensing of dogs and the extermination of those that are not licensed.
2. The proper muzzling of all dogs when they are in public places or on public highways.
3. To hold dog owners responsible for the damage traceable to their dogs.

Every dog should be required to wear a collar inscribed with the license number and the name and address of the owner. The cost of the license, collar, and muzzle would be a price by no means great to pay for the privilege of keeping a dog.

No one should oppose the capture and the speedy and painless destruction of homeless and ownerless dogs. These are the members of the canine family that do the most harm. They have wits that are sharpened by the struggle for existence to which they are constantly exposed. The outcast dog, the so-called "yellow cur," roams far and wide; he acts cowardly in the presence of danger, but it is only a surface cowardice based on bitter experience that has taught him to reserve his energies; when he is cornered, or when there is anything to gain, he fights and fights hard. I have no animosity toward this mongrel waif; he merits respect, and if he were not a menace to the public safety, I should regret to see him exterminated.

The ownership of animals imposes obligations, both relative to the animals and to the communities in which they are owned. This statement is accorded the value of a truism when it is applied to an underfed or overworked or otherwise abused horse, or to a dangerous bull that is allowed to frequent a public common or highway unattended. But when we apply it to the dog it is quite another matter, and yet a rabid dog is more dangerous than a bull with a vicious disposition.

IMPORTANCE OF CAREFUL OBSERVATION OF DOGS.

But without the enactment of additional laws much can be done to reduce the danger from rabies. Every owner of a dog should examine it daily with sufficient care to detect marked changes in its physical condition and character that may be the symptoms of approaching disease, and when such changes are observed the dog should be so confined that, should it become affected with rabies, it will not be able to communicate the disease to persons and animals. This is very little to ask of dog owners. If they care for their dogs as they should, no special effort will be required to watch them carefully; and to properly isolate a dog when he is sick, or not quite normal, is a common-sense proceeding that should be universally practiced not only with dogs, but with all animals and persons that are sick, until it can be determined that they are not affected with a disease of the infectious or communicable kind. All diseases of dogs are not rabies, and rabies is not the only infectious disease of dogs. Proper confinement and isolation the moment dogs show a variation from their normal condition will reward itself in time, in addition to the effect it will have on the suppression of rabies, through a considerable reduction in the frequency with which diseases like mange, canine distemper, etc., occur.

Before a dog becomes affected with the active, furious form of rabies he commonly shows some preliminary symptoms. It is to be regretted that they are vague, indefinite, and uncertain. The dog may be morose and irritable or appear more affectionate than usual; he may be dull and stupid, or unusually nervous and excitable. Once the disease is fully developed there is nothing uncertain. The blind, desperate fury, followed by paralysis and death, are absolute diagnostic symptoms, but can not be observed by the owner unless the dog has been confined in time to keep him from running perhaps miles away from home.

Another precaution for dog owners to take is a careful examination of their dogs for injuries inflicted by other dogs when it is known that a dog in the neighborhood has become affected with rabies, or that a rabid dog has passed through the neighborhood. When injuries are found, the owner should either watch his dog with redoubled vigilance, muzzle him, and place him in confinement, or have him destroyed in a painless manner. Since dogs are at all times apt to bite each other, frequently in play without viciousness, and rabies may be communicated by the bite of a rabid dog certainly as early as six days, and according to some authorities eight days, before the symptoms are apparent, this precaution for the safety of animals and persons is really an imperative obligation to the community imposed by the ownership of dogs.

DUTIES AND RESPONSIBILITIES OF DOG OWNERS.

Dog owners should bear in mind that, in urban if not in rural communities, they constitute a minority, and that even among themselves many, probably the majority, realize the great need of measures for the suppression of rabies. Unless precautions against the persistence and spread of rabies, such as have been suggested, are taken by dog owners, the enactment and enforcement of laws of the nature hereinbefore specified will become imperative. The reason why laws of this nature have not been made is due to the active fight against them by a small, greatly interested minority that opposes a tardy, disinterested majority. The minority fights hard for a privilege it has long enjoyed and abused, that of allowing dogs to be at large without restraint at all times, and the majority has never half realized that this privilege is costing a high price in the destruction of property and in horrible agony and numerous deaths. Many of our large cities are supporting institutes for the treatment of persons who have been bitten by rabid or mad dogs; other cities are contemplating the establishment of such institutes, and the need for such institutes is wholly the outgrowth of the difference between the liberty and privileges given dogs and those allowed to other domestic animals.

The real question is not one of affection for or animosity to the canine species. The dog, in his place, under proper observation and properly restricted, is an admirable, intelligent, companionable animal. This article has been written from the viewpoint of the dog owner. The writer has owned one or more dogs as long as he can remember, and now owns six of them. They are sheltered, well nourished, and contented, and are kept under conditions which insure that they shall not be an expense or a danger to the neighbors or to the community.

The dog owner who knows what rabies is from experience, if he has the proper consideration for his own welfare and that of his dogs, will be among the first to demand a movement for its suppression, even if this should place restrictions on the freedom of his dogs. His interest is greatest because he has the most at stake and is himself most seriously and frequently exposed to the infection.

INSTRUCTIONS FOR PREPARING AND SHIPPING PATHOLOGICAL SPECIMENS FOR DIAGNOSIS.

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While laboratories for research in veterinary medicine are still but thinly scattered over our country, they are nevertheless sufficiently numerous to be within reach of the majority of sections. This, together with the present elaborate technique and scientific methods of diagnosing various obscure diseases of our domestic animals, makes it wise for veterinary inspectors and practitioners to acquaint themselves with the methods of obtaining and preparing tissues to be sent to the laboratory for pathological and bacteriological studies. The great assistance which the laboratory should be able to render to veterinarians and others in various disease conditions is in many cases reduced to a minimum by carelessness or indifference on their part in preparing the specimens before shipment. Where the proper measures are not taken, the specimens are often irretrievably spoiled for pathological work by the time they reach the laboratory, even though they are in a fresh condition when taken from the animal. In other cases, where a micro-organism is to be isolated to establish a diagnosis, it has become so badly contaminated by the abundant growth of saprophytic organisms that it is either never isolated or the time required is so great that the report of the laboratory is too long in being received to be of any material benefit to the interested person.

In many cases the mode of preparation of tissues must vary somewhat, depending upon whether they are to be used for pathological or bacteriological work. A dead body commences to undergo decomposition as soon as rigor mortis passes off, and in the case of the internal organs almost immediately on their exposure to the air. All solutions which will rapidly kill and properly fix the individual cells of a tissue are antiseptic and will render hopeless the procuring of any cultures. On the other hand, tissues not placed in such solutions will undergo more or less putrefactive changes during transit, which may destroy the delicate arrangement and staining properties of the cells so essential to proper pathological study. It must therefore be first considered which of the two is the more important in rendering the desired information, and, if possible, a method should

be secured which will answer for both, at least in a certain percentage of cases.

In all forms of infectious diseases the isolation of the specific organism is the crucial test in establishing the diagnosis, and therefore the bacteriological examination is the more important. On the other hand, in cases of tumors, cirrhosis of the liver, nephritis, etc., a bacteriological examination gives no positive information and the entire diagnosis rests on the microscopic examination of sections. In many instances, however, these two branches of medical science overlap each other and both are necessary in establishing the nature of the diseased condition. In such cases two sets of tissues have to be prepared during warm seasons or where the time for transit requires thirty-six hours or longer.

TISSUES TO BE FORWARDED.

The selection of the organs or parts of organs to be forwarded requires careful consideration. In cases where the infection is general, as in many infectious diseases, all the viscera as well as the blood will contain the causative organisms. In such cases organs for bacteriological examination should be taken which are least liable to be contaminated post-mortem, as examples of which may be mentioned the heart, the spleen, and the lymphatic glands. The liver and the pancreas, on account of their direct communication with the intestinal tract through their excretory ducts, are more liable to infection with saprophytic organisms than the above, which have no communication with the exterior. It must be remembered, however, that in any condition where the lesion appears to be local the importance of sending the affected viscera, as the liver or even the intestine, which always contains many varieties of bacteria, greatly outweighs the increased danger of contamination with other organisms. Where any doubt exists as to whether the condition is local or general, the spleen or the heart should be forwarded in conjunction with the seemingly localized lesions.

GENERAL DIRECTIONS.

In case a number of animals are showing symptoms of an unknown or obscure disease, it is better to obtain one which has recently died, or to kill one of the worst affected cases for post-mortem examination, and also to obtain fresh material to send to the laboratory for diagnosis. Where the disease is devastating the smaller animals, as poultry, or even sheep and swine, a positive diagnosis is more likely to be obtained by sending to the laboratory by express one of the animals showing well-advanced symptoms.

In making the post-mortem examination in the field, if the operator

has any idea that laboratory assistance will be necessary in rendering a diagnosis he should keep the fact constantly in mind during the procedure. Immediately upon opening the large body cavities the parts to be forwarded should be at once removed. As a general routine, the spleen and the heart are the organs which should be forwarded for a bacteriological examination, and they should be removed with the greatest caution and handled as little as possible. The heart should have all the large vessels ligated with string which has been immersed in a solution of bichlorid of mercury, 1 to 1,000, or in some other antiseptic solution. The knife and forceps used in removing the viscera should be either flamed over an alcohol lamp or over the flame of a match, or washed in an antiseptic solution, as 5 per cent carbolic acid. After removal the viscera should be laid separately on cheese cloth which has been saturated and thoroughly wrung out of bichlorid of mercury solution, 1 to 1,000, and wrapped up with several layers of the material. They should then be wrapped in paraffined or oiled paper and placed in a box for shipment. In the case of small animals the entire organs should be forwarded, as sections which necessitate the exposure of the parenchyma increase the liability to invasion with extraneous bacteria. In the case of large animals a portion of the spleen may be cut off, especial care being taken that the knife is sterile. The heart, however, must always be left intact. In addition to these organs, such other parts as show especially marked or peculiar lesions should also be forwarded, each piece being wrapped separately in the bichlorid gauze.

When intestines are to be forwarded the section should be removed and the excess of alimentary contents washed away by dipping in clear water. If the bowel is empty, it is better to tie both ends before removing and wrap in the gauze immediately, without washing. If during removal the tissues become covered with blood, it should be wiped off with gauze wrung out of bichlorid solution and not washed off in water. Removal of any foreign bodies, as dirt, straw, etc., should never be necessary, as such contamination should be scrupulously avoided.

Covering the tissues with a thick layer of powdered boric acid and wrapping in dry gauze is also practiced considerably and is equally valuable as the damp gauze, but has the disadvantage of being harder to remove at the laboratory. Juicy or friable tissues had better be placed in sterile or thoroughly clean glass containers without wrapping. Under ordinary conditions when the tissues are taken immediately after death and the laboratory is near by, the above mode of preparation preserves the tissues sufficiently well for pathological work. During exceptionally warm weather, however, or when friable parts are to be sectioned, and especially when tumors are to be forwarded, other methods have to be used in the preparation.

In these cases small plugs of tissue one-half to 1 inch square are all that are required. These should be cut, whenever possible, so as to include a part of the normal tissue with the diseased areas. The knife should be reasonably sharp to prevent crushing the connective tissue framework and destroying the cell arrangement. Strict antiseptic precautions are not necessary in securing such pieces of tissue, as they are to be immediately placed in antiseptic solution and no cultures are desired. Probably the most easily obtained and efficient fluid to forward such tissues in is a 4 per cent solution of formaldehyde gas in water (10 per cent solution of formalin), the quantity of which should be from 10 to 20 times the volume of the tissues to be placed in it. Alcohol may also be recommended in the absence of the above fluid, but it should be at least 80 per cent strength; 95 per cent is preferable. Orth's fluid, consisting of—

	Parts.
Bichromate of potassium-----	2
Sodium sulphate-----	1
Water-----	100
Formaldehyde, 40 per cent-----	10

is better than either of the above, but the potassium bichromate is not always obtainable, and the formalin alone is sufficient. If it is to be used, the formalin should not be added until just prior to shipping, as it leads to precipitation in a few days.

SPECIAL METHODS OF PREPARING TISSUES.

There are some important diseases in which the laboratory worker would be unable to render a diagnosis from the previously mentioned tissues. As examples may be mentioned rabies, cerebro-spinal meningitis, tetanus, etc. In the latter two diseases the history and symptoms are usually sufficient to make a diagnosis, and the tissues frequently give but little information. Some special directions may, however, be given in regard to rabies, anthrax, tuberculosis, and glanders.

RABIES.

Rabies is a disease in which the laboratory is able to give very material aid. In cases where persons have been bitten by a suspected rabid animal a laboratory diagnosis is often demanded even though competent and experienced veterinarians have pronounced the case rabies from a careful observation of the symptoms and course of the disease.

When a dog or other animal has died of suspected rabies and a positive diagnosis is desired, the carcass should be autopsied to exclude other causes of death. Particular attention should be paid to the stomach to ascertain the presence of foreign bodies and any

inflammatory condition of the gastric mucous membrane, both of which are indicative but not at all conclusive signs of rabies. The head with the skin intact should then be removed by cutting through the middle of the cervical vertebræ; it should be wrapped in dry cheese cloth or other material and forwarded by express. During very warm weather, after wrapping the head, it should be placed in a tin receptacle and packed in a wooden box containing chopped ice. By removing the head at the middle of the cervical vertebræ the plexiform ganglia are left intact and upon arrival at the laboratory they can be removed and examined microscopically for the lesions described by Van Gehuchten and Nelis and a diagnosis made within twenty-four hours. This is not practicable when several days are required for the head to reach the laboratory, as the brain undergoes softening, becomes invaded with bacteria, and the experimental rabbits inoculated are liable to die from septicemia. Putrefactive changes are also liable to occur in the ganglia and thus render the conclusions from their examination indefinite.

In such cases the brain, including the medulla oblongata, should be removed as carefully as possible in one piece, immersed in two to three times its volume of pure neutral glycerin, and sent in this manner. In large animals one cerebral hemisphere and the medulla are sufficient. In some cases even with this method the Negri bodies can be demonstrated in the large nerve cells of the hippocampus major and thus a diagnosis made in a few hours without waiting for the rabbits to develop the disease, which requires from two to three weeks.

It must be remembered, however, that to get the best results with the rapid methods of diagnosis it is essential that the animal be allowed to die naturally from the disease, as when killed in the early stages the changes in the central nervous system have frequently not developed sufficiently to be recognized.

ANTHRAX.

In cases of anthrax a post-mortem examination should be made with great care or not at all. The *Bacillus anthracis* only forms spores in the presence of oxygen, and therefore so long as the carcass is left intact spore formation does not occur. From the fact that the spores are so resistant and infection of the premises is such a serious matter, it is advised by some authorities not to make a post-mortem examination. Instead remove one ear from the carcass, wrap it in gauze wrung out of a 1 to 1,000 solution of bichlorid of mercury and forward this to the laboratory, relying entirely upon the bacteriological examination to establish the diagnosis. This may also be accomplished by allowing two or three drops of blood from the

ear to drop at different points on a piece of ordinary writing paper. After it has thoroughly dried it may be folded inside a second piece of paper and forwarded in a mailing case.

TUBERCULOSIS.

In tuberculosis, while blood infection does occur, the organisms can rarely be demonstrated in the blood, and therefore unless the heart or spleen show lesions of the disease they are of no value in diagnosing the condition. The peculiar staining properties of the tubercle bacillus render it easy to recognize, even when very badly mixed with other organisms. It must be remembered, however, that in old tuberculosis lesions it is very difficult, and often impossible, to demonstrate the tubercle bacillus. Therefore in sending tuberculous tissues care should be taken to get the young lesions, or those with areas of inflammation about them which show that the process is actively going on and thereby assures the presence of the tubercle bacillus provided the disease is tuberculosis. Such tissues should be wrapped in the bichlorid gauze, as previously described.

GLANDERS.

In forwarding material from suspected cases of glanders for the guinea-pig test of Strauss, the nasal discharge, or the oily serum from a farcy bud, should be selected. It is best obtained on a cotton swab prepared in the following manner: A piece of absorbent cotton is wrapped about the end of a piece of thick wire or portion of an umbrella rib. This should then be placed inside of a glass tube and the latter plugged with a cotton plug, the end of the wire being allowed to project beyond the tube. The plugged tube containing the swab should then be sterilized by dry air or steam. When this sterilization is impossible, the tube and wire should first be boiled, and with thoroughly cleaned hands the swab and plug can be made from sterilized absorbent cotton as purchased from pharmacists.

In collecting the material an assistant should hold the animal's head. The veterinarian holds the tube and plug in the left hand, while with the right hand he withdraws the swab from the tube by grasping the end of the wire; he then passes it up into the nostril, turns it once or twice to collect the discharge, and replaces it in the tube, carefully inserting the plug. It should be taken to the laboratory in person, if this is possible, as any considerable delay would render the material useless.

Where the diagnosis of glanders by the serum agglutination reaction of McFadyean is desired, it is essential that the blood be drawn in a sterile condition. For this purpose 25 c. c. of blood is sufficient, and it is best obtained from the jugular vein. The site of operation

should have the hair clipped away or shaved and thoroughly washed with soap and water followed by some antiseptic solution, as 5 per cent carbolic acid or 1 to 1,000 bichlorid of mercury. The trocar used in making the puncture, as well as the tube or bottle with a rubber stopper in which the blood is to be collected, must have boiled for fifteen minutes just prior to being used. The results from this test, however, are in some cases indefinite, and when the animals are showing symptoms of the disease Strauss's test is more reliable. Its chief value lies in detecting incipient glanders in a stable where acute cases have recently developed and the results of the mallein tests are indefinite.

CLINICAL LABORATORY WORK.

This is but rarely taken advantage of among veterinary practitioners. Several good reasons may be given for this, among which may be mentioned (1) the fact that in many cases the economic value of the patient is not sufficient to justify the procedure; (2) the laboratory making the examinations must be close at hand; and (3) the value of such work is not generally recognized by the profession.

Blood counts are rarely made, while hemoglobin estimations, though more frequent, are still not in general use. Urine analysis is also infrequently resorted to for diagnostic purposes, although it is probable that if this were to become a routine practice many cases of kidney disease would be diagnosed which at present are never recognized.

In sending urine to the laboratory for analysis it is preferable to have a portion of a 24-hour sample forwarded, but this is practically impossible, and therefore a sample has to be secured whenever opportunity offers. From 150 to 200 c. c. should be placed in a previously boiled glass container, and, as many bacteria frequently present in urine have a disintegrating effect on casts and other cellular elements in the urine, the specimen should reach the laboratory in the shortest possible time.

MILK.

In securing milk for a bacteriological examination the udder and teats should first be thoroughly washed off with soap and warm water, followed by some antiseptic solution, after which the excess of fluid should be wiped off with a clean towel. The first two or three streams of milk should be discarded, after which it should be milked directly into a previously boiled glass bottle. For ordinary examination 50 c. c. is sufficient. It must, however, be forwarded expeditiously, as milk is an ideal culture media for germs, and they multiply very rapidly in it.

SKIN DISEASES.

In skin diseases a differentiation between parasitic and nonparasitic diseases, as well as the nature of the parasite, if present, can often be made by microscopic examination of the scrapings. Thus considerable assistance may be obtained in rendering a prognosis as well as in the methods of treatment. Such scrapings should be fairly deep, at least into the true skin. They may be merely wrapped in paper and mailed in an ordinary envelope or forwarded in small homeopathic glass vials. They must never be taken, however, until at least twenty-four hours after applying any treatment to the parts, as this will very likely destroy all the parasites in the superficial layers of the skin and render their detection difficult or impossible.

Ticks which may be suspected of being the *Boophilus annulatus*, the carrier of the causative agent of Texas fever, or any other external parasites, may be forwarded for identification by placing a few specimens, both male and female, in a small glass bottle, lightly corked with cotton, or any other convenient container, and mailing it to the laboratory in a mailing case.

MUSEUM SPECIMENS.

When especially well-developed or unusual lesions are found in any animal the laboratory is often desirous of preserving the entire affected organ or part as a museum specimen. When such a procedure is contemplated it is necessary, in order to obtain the best results, that the parts be placed in the preserving fluid before they have undergone any post-mortem decomposition and without their surfaces becoming dry to any considerable degree.

The method of Kaiserling is undoubtedly the best method of preserving tissues so as to retain their natural color. This method consists in placing the tissues in a fixing solution consisting of—

Potassium ultrate.....	grams..	15
Potassium acetate.....	grams..	30
Formaldehyde.....	c. c..	200
Water.....	c. c..	1,000

After having been left in this solution a variable length of time, depending on their size and consistency, they are removed, passed through increasing strengths of alcohol to restore the color, and finally preserved in—

Potassium acetate.....	grams..	200
Glycerin.....	c. c..	400
Water.....	c. c..	2,000

It is only necessary to prepare the first solution in the field and forward the specimen in this to the laboratory. If the potassium salts can not be procured, the tissues may be fairly well preserved

until they reach the laboratory by merely using the formaldehyde and water. Alcohol is also a very good preservative and more economical than the preceding, but it has the disadvantage of not maintaining the natural color of the specimen for any length of time. When preservation of color is not essential alcohol is probably the best simple substitute for Kaiserling's method.

LABELING AND INFORMATION TO ACCOMPANY SPECIMENS.

After wrapping each piece of tissue separately in gauze it is sufficient to have one container for all the specimens from one animal, but in no case should specimens from different animals be put in the same container, as they are often hard to differentiate at the laboratory. The separate containers, however, may all be packed in one box. Each container should be labeled with the name of the various tissues which it contains as well as the species of animals from which they were taken.

It is also very important for all packages to have written or painted on them the name and address of the sender. Within a period of five months three specimens were received at this laboratory unaccompanied by letters and with nothing on the packages except the postmark to indicate their origin. One was a tuberculous spleen, the container of which was postmarked Chicago, but although a letter diagnosing the case was forwarded to the inspector in charge of meat inspection at that station, the sender was not found. Another specimen, a case of demodectic mange affecting the skin of a hog, was received under similar conditions, while the third consisted of tuberculous lymph glands from a hog. These were all quickly and easily diagnosed, but the senders remain in ignorance of the results because they failed to write concerning the specimens and failed to mention their origin on the packages.

Specimens should always be accompanied by a letter giving full information regarding the particular case from which they were taken, as to age, history, symptoms, post-mortem findings, etc. In addition to this, where a number of animals are affected, complete details of the outbreak should be given, together with any peculiar symptoms shown by one or more of the cases; whether there had been any similar outbreaks; if animals on near-by farms were showing the same trouble; the number of animals that had died, and such other information as is liable to be of assistance to the laboratory worker in drawing conclusions from the results obtained.

Below will be found the postal regulations relative to the mailing of diseased tissues. Where the packages are too large for mailing, or if the use of the mails is undesirable for other reasons, the specimens should be forwarded by express to the Chief of Bureau of

Animal Industry, Pathological Division, Washington, D. C., with the name and residence of the shipper plainly indicated. Mail packages should be similarly marked.

EXTRACTS FROM POSTAL LAWS, REGULATIONS, AND CONVENTIONS, 1902.

SEC. 495. Specimens of diseased tissues may be admitted to the mail for transmission to United States, State, or municipal laboratories only when inclosed in mailing packages constructed in accordance with this regulation.

2. Liquid cultures, or cultures of micro-organisms in media that are fluid at the ordinary temperature (below 45° C. or 113° F.) are unmailable. Such specimens may be sent in media that remain solid at ordinary temperatures.

3. Upon the outside of every package of diseased tissues admitted to the mails shall be written or printed the words "Specimen for Bacteriological Examination. This package to be treated as letter mail."

4. Packages used for conveying through the mails pathological specimens for bacteriological examination for diagnosis in cases of suspected diphtheria, tuberculosis, and other communicable diseases shall be constructed and prepared as follows:

a. The receptacle for moist specimens of diseased tissues shall be a strong glass vial or test tube having a capacity not greater than 2 drams. The vial shall be covered and made water-tight by the use of a metal screw cap and a rubber or felt washer which has been immersed in melted paraffin, or, if a test tube be used, it shall be covered with a tightly fitting rubber cap.

b. The vial or test tube shall be placed inverted in a circular tin box, which shall be made of I. C. bright tin plate, and have flush or countersunk bottom and soldered joints and not be smaller than 1½ inches in diameter and 3 inches long, nor larger than 2½ inches in diameter and 5½ inches long. This box shall be closed by a metal screw cover and a rubber or felt washer, or tightly fitting metal sliding cover, and shall be so packed with absorbent cotton, closely laid, that the glass or test tube contained therein shall be evenly surrounded on all sides by cotton.

c. The tin box shall be placed inverted inside of a larger tin box similar to the one already described, which should snugly receive the specimen box. Upon the inside of the sides and bottom of this outer box there shall be a lining of compressed paper not less than three-sixteenths of an inch in thickness. This outer tin box shall be closed by a metal screw cap and a rubber or felt washer. This outside box may also consist of hardwood in the form of a block with a cylindrical hole bored in one end and extending to within not less than 1 inch of the opposite end; the open end to be closed with a wooden or metal screw cap with a rubber or felt washer. Or the outside box may be a cylindrical wooden box having a screw cap and washer. The thickness of the sustaining part of the wooden tube must be not less than one-quarter of an inch and be lined same as the tin box.

d. The receptacle for dry specimens of diseased tissues shall be a glass test tube 3 inches in length and one-half inch in diameter. This test tube shall be inclosed in a circular tin box similar to those already described, but measuring 2½ inches in diameter and 5½ inches in length, and be lined upon its sides and bottom with compressed paper not less than one-quarter of an inch in thickness. The test tube shall be closely packed in cotton, and the box shall be closed by a metal screw cap and a rubber or felt washer.

THE PREVENTION OF PARASITIC INFECTION IN LAMBS.

Report of First Series of Field Experiments.

By B. H. RANSOM,

Chief of the Division of Zoology.

PLAN OF EXPERIMENTS.

A series of field experiments was begun, in July, 1905, at the Experiment Station of the Bureau of Animal Industry, Bethesda, Md., near Washington, with the cooperation of Dr. E. C. Schroeder, superintendent of the station, for the purpose of gaining information concerning the life history of some of the more important species of roundworms parasitic in the alimentary canal of sheep, of which little was definitely known. The ultimate object was to determine methods by which infection with these parasites may be avoided. In addition to the field experiments, a laboratory study of the most important of these parasites—namely, the twisted stomach worm, *Hæmonchus contortus*—has been carried on, some of the results of which have already been published.*

The objects of the first series of field experiments were as follows:

Experiment No. 1.—To determine whether lambs from ewes infested with roundworm parasites will become infected if kept in noninfested pens apart from their mothers, except during short periods when they are allowed with the latter in clean pens for suckling.

Experiment No. 2.—To determine how long sheep will remain infested with roundworm parasites if kept on a clean board floor and supplied with clean fodder and water.

Experiment No. 3.—To determine whether fields pastured by sheep infested with roundworm parasites will retain their infection over winter if the animals are removed in the fall and the fields left empty until the following spring.

For these experiments a flock of 50 ewes was obtained which were infested with twisted stomach worms (*Hæmonchus contortus*), hookworms (*Monodontus trigonocephalus*), and nodular worms (*Oesophagostomum columbianum*), as well as various other species of round-

* The Life History of the Twisted Wireworm (*Hæmonchus contortus*) of Sheep and Other Ruminants. (Preliminary report.) Bureau of Animal Industry Circular 93. Pp. 7, figs. 2. 1906.

worms of minor importance. These facts were determined first by microscopic examination of the feces and later by autopsies on about one-fourth of the number which died or were killed, 14 being examined post-mortem during the year, from July, 1905, to July, 1906. Parasites were found in each case, the nodular worm being present in all, the twisted stomach worm in 9, and hookworms in all but 2.

When the flock was brought to the Experiment Station, in July, 1905, it was divided into three lots. Twenty were placed in a large pen (No. 1) on high ground, 10 in a pen (No. 2) with board floor, and the remainder in a pen (No. 3) on low ground containing a pool of stagnant water. October 25, 1905, the sheep were removed from pens Nos. 1 and 3, leaving them empty, and a ram was placed with each lot of ewes on the same date.

The ewes began to lamb the following March, and the lambs were separated from their mothers within twenty-four hours after birth and placed, several together, in box stalls with hard dirt floors. The ewes occupied stalls near by, and other stalls were used as nursing stalls, into which the ewes and lambs were turned together at frequent intervals for suckling. All of the stalls were thoroughly cleaned before they were used, and the droppings left in the nursing stalls were removed after each nursing period.

EXPERIMENT No. 1a.

In this experiment, the lambs which had been allowed to suckle under the conditions described above were weaned at an early date and removed to clean pens—that is, pens which had not been occupied by sheep, goats, or cattle for several years, and therefore undoubtedly free from infection with parasites affecting sheep. Later the lambs were killed and examined for the presence of parasites, with the following results:

No. 201. Born March 25; weaned and placed in clean pen May 21; killed September 10. Twisted stomach worms, none; hookworms, none; worm nodules, few.

No. 202. Born March 26; weaned and placed in clean pen May 24; killed September 12. Twisted stomach worms, none; hookworms, none; worm nodules, several.

No. 203. Born March 25; weaned and placed in clean pen May 24; killed October 22. Twisted stomach worms, none; hookworms, none; worm nodules, 4 or 5.

No. 204. Born March 26; weaned and placed in clean pen May 21; killed September 11. Twisted stomach worms, 1; hookworms, none; worm nodules, rather numerous.

No. 208. Born April 7; weaned and placed in clean pen May 22; died July 5. Twisted stomach worms, none; hookworms, none; worm nodules, none.

No. 209. Born April 2; weaned and placed in clean pen May 21; killed September 15. Twisted stomach worms, none; hookworms, none; worm nodules, numerous.

No. 214. Born March 29; weaned and placed in clean pen May 22; killed September 12. Twisted stomach worms, none; hookworms, none; worm nodules, several.

No. 215. Born March 27; weaned and placed in clean pen May 22; killed September 11. Twisted stomach worms, none; hookworms, none; worm nodules, numerous.

No. 218. Born April 12; weaned and placed in clean pen May 24; killed September 13. Twisted stomach worms, none; hookworms, none; worm nodules, present.

No. 219. Born April 12; weaned and placed in clean pen May 24; killed September 18. Twisted stomach worms, 1; hookworms, none; worm nodules, several.

No. 220. Born April 12; weaned and placed in clean pen May 24; killed September 17. Twisted stomach worms, none; hookworms, none; worm nodules, 1.

No. 221. Born April 23; weaned and placed in clean pen May 24; killed September 8. Twisted stomach worms, none; hookworms, none; worm nodules, 3 or 4.

No. 224. Born May 18; weaned and placed in clean pen July 10; killed October 11. Twisted stomach worms, none; hookworms, none; worm nodules, 3 or 4.

EXPERIMENT No. 1b.

In connection with the foregoing experiment it was deemed advisable to keep a number of lambs continuously in the same pen with their mothers, in order to obtain data as to the extent of infection under those conditions, which might be of value for purposes of comparison. Accordingly four lambs which prior to May 21, 1906, had been kept separate from their mothers, except when suckling in a clean pen (as in Experiment No. 1a), were kept continuously in the same pen with their mothers after that date, no precautions being taken to prevent infection. About two months later two of the lambs were removed to a noninfected pen, and the other two remained with their mothers as before.

LAMBS KEPT IN SAME PEN WITH MOTHERS MAY 21 TO JULY 19, AND THEN REMOVED TO A CLEAN PEN.

No. 206. Born April 3; killed September 7. Twisted stomach worms, considerable number; hookworms, none; worm nodules,^a none recorded.

No. 211. Born April 9; killed October 10. Twisted stomach worms, numerous; hookworms, none; worm nodules, none.

LAMBS KEPT IN SAME PEN WITH MOTHERS CONTINUOUSLY AFTER MAY 21.

No. 207. Born April 3; killed September 6. Twisted stomach worms, considerable number; hookworms, few; worm nodules,^a none recorded.

No. 212. Born April 9; killed October 11. Twisted stomach worms, many; hookworms, none; worm nodules, none.

Of the thirteen lambs in Experiment No. 1a all but two became infested with nodular worms, but only three had more than a very

^a No special search was made for worm nodules in Nos. 206 and 207, and some may have been present which were overlooked.

light infestation, and the four lambs in Experiment No. 1*b*, after having been with their infested mothers in a bare pen from two to nearly five months, showed no infestation with nodular worms, with the possible exception that in two of them there may have been a light infestation which was overlooked. No infestation with hookworms took place among the thirteen lambs in Experiment No. 1*a*, but one of the lambs in Experiment No. 1*b* which was kept in the same pen with infested ewes for three and one-half months became infested, while the other three escaped infestation, although one of them had remained in the same pen with the infested ewes for nearly five months. Only two of the thirteen lambs in Experiment No. 1*a* became infested with twisted stomach worms, a single worm being found in each case, while all of the lambs which had remained from two to nearly five months with their mothers in a bare pen became more or less heavily infested.

This experiment partly confirms the results of Dalrymple's experiments (1903-1906) in which the attempt was made to raise lambs free from parasites, first, by keeping the lambs separate from their mothers except when suckling (as in Experiment No. 1*a* above), and, second, by keeping the lambs and mothers together in a bare lot (similar to that used in Experiment No. 1*b* above).

Dalrymple determined that when the lambs and mothers were kept separate, as in Experiment No. 1*a*, the lambs remained entirely free from nodular worms and twisted stomach worms. When the "bare-lot" method was used he found that the lambs were not protected from infestation with twisted stomach worms, but that they remained "practically free from nodule disease of the intestines."

The experiments reported in the present paper bear out Dalrymple's statement with regard to the occurrence of infestation with the twisted stomach worm if the "bare-lot" method is used, but show that there is also danger of slight infestation even if the lambs are kept separate from their mothers except when suckling. It is also shown by these experiments that in some cases considerable infestation with nodular worms may result when the lambs are kept separate from their mothers except when suckling, although in most instances the lambs will escape with but slight infestation, and it may be therefore concluded that the less stringent "bare-lot" method of Dalrymple will not in all cases keep lambs "practically free" from infestation with nodular worms, though it may do so in most instances.

EXPERIMENT No. 2.

In the second experiment the ten sheep placed in the pen with the board floor (No. 2) were kept there continuously after July, 1905, with the exception of four which bore lambs and were removed from this experiment in the spring of 1906. Pen No. 2 was kept free from

manure by daily sweeping and the sheep were fed from a raised rack and supplied with water in a trough which was frequently cleaned. By this means the chances of reinfestation, although not altogether removed, were reduced to a minimum. Four of the sheep in this pen have been killed and examined for parasites, with the following results:

No. 167. Killed January 12, 1906, after occupying pen No. 2 for six months. Twisted stomach worms, about 100 present; hookworms, about 12; nodular worms, about 24.

No. 169. Killed September 5, 1906, after occupying pen No. 2 for fourteen months. Twisted stomach worms, few; hookworms, few; nodular worms, presence of adult worms not recorded, but an enormous number of worm nodules were present on walls of large and small intestine.

No. 171. Killed February 20, 1907, after occupying pen No. 2 for nineteen months. Twisted stomach worms, 5; hookworm, 1; nodular worms, no adults present, but there were numerous nodules on the cecum, some of which contained living larval worms.

No. 172. Killed February 23, 1907, after occupying pen No. 2 for nineteen months. Twisted stomach worms, 4; hookworms, 10; nodular worms, no adults present, but there were numerous nodules on the cecum, some of which contained living larval worms.

EXPERIMENT NO. 3.

In order to determine whether pens Nos. 1 and 3, from which the infested sheep were removed October 25, 1905, after having been occupied since July, 1905, remained infested over winter, newly weaned lambs were placed in them in June, 1906, and later killed and examined. Until weaned these lambs were kept separate from their mothers, except when allowed with the latter in clean stalls at frequent intervals for suckling, exactly as in the case of the lambs used in the first experiment.

LAMBS PLACED IN PEN NO. 1 JUNE 16, 1906.

No. 223. Born April 26, 1906; killed September 14, 1906. Twisted stomach worms, numerous; hookworms, none; worm nodules, none.

No. 225. Born April 21, 1906; killed October 6, 1906. Twisted stomach worms, numerous; hookworms, none; worm nodules, 2 or 3.

LAMBS PLACED IN PEN NO. 3 JUNE 16, 1906.

No. 222. Born May 2, 1906; killed September 10, 1906. Twisted stomach worms, few; hookworms, none; worm nodules, few.

No. 226. Born May 2, 1906; killed October 6, 1906. Twisted stomach worms, numerous; hookworms, none; worm nodules, 2 or 3.

Since the lambs in this experiment all became more or less infested with twisted stomach worms, since none became infested with hookworms, and since none showed more than an extremely light infestation with nodular worms, it is evident, on comparison with experiment No. 1a, in which the lambs placed in clean pens after weaning showed practically no infestation with twisted stomach worms, none

with hookworms, and in many cases even a heavier infestation with nodular worms; that the pens in Experiment No. 3 remained infested with twisted stomach worms over winter, but that the infestation with hookworms and nodular worms had died out in the eight months which elapsed from October to June.

CONCLUSIONS.

From these experiments the following conclusions may be drawn:

Lambs from infested ewes will remain free from hookworms if separated from their mothers soon after birth and afterwards allowed with them in a clean pen only during short periods for suckling, the manure being removed each time the pen is used, and if the lambs when weaned are placed by themselves on noninfested pasture. Infestation with twisted stomach worms may be almost entirely avoided by this method. Lambs raised by this method from infested ewes will rarely altogether escape infestation with nodular worms. Usually they will escape with a light infestation, and in a few instances they may become rather heavily infested.

The "bare-lot" method of Dalrymple does not protect lambs from infestation with twisted stomach worms. In some cases infestation with hookworms may not occur when the "bare-lot" method is used. With the "bare-lot" method some lambs may escape infestation with nodular worms, but in most cases a slight infestation will occur, and occasionally a rather heavy infestation may take place.

Sheep infested with twisted stomach worms, hookworms, and nodular worms, if kept on a clean board floor and supplied with clean fodder and water, will still be more or less infested after the lapse of nineteen months.

Pastures on which infested sheep have grazed will not become free from infestation with twisted stomach worms after remaining empty from October 25 to June 16, climatic conditions being similar to those of Washington, D. C.

Pastures on which infested sheep have grazed will be free from infestation with hookworms and nodular worms after remaining empty from October 25 to June 16, climatic conditions being similar to those of Washington, D. C.

ANIMAL BREEDING AND DISEASE.^a

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AND

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INTRODUCTION.

Disease in its relation to animal breeding is a broad subject and presents so many separate topics that an attempt to discuss them all within the limits of a short paper is out of the question, and to make a proper selection is difficult.

All diseases are objectionable to the breeder, not only those with which something of a hereditary character is associated, but also those that are entirely dependent upon and are induced by exposure to an adverse or pernicious environment. The best results in breeding require the most favorable conditions. Health may be regarded as the first essential of perfection, and everything that either insures or endangers it is of primary importance.

An animal is a complex group of interrelated physical and chemical processes. Every act or occurrence associated with it, whether normal or abnormal, voluntary or involuntary, is accompanied by positive physical and chemical changes. The relationship of the various organs and structures is so intimate that a merely superficial knowledge of anatomy and physiology is sufficient to show that no organ or structure can be affected without some influence on the aggregate. When disease is present or suspected the first step in the study of symptoms usually is to determine the temperature; and the almost universal use of the clinical thermometer by doctors of human and veterinary medicine is based on the intimate connection and association of each thing with everything else in the animal body. In the presence of fever, which is the commonest symptom of disease, the increased temperature exists not alone in the diseased organ or near to it, but in every portion of the organism. The sympathy between the whole and all its parts is so complete and perfect that it has

^a Paper presented at a meeting of the American Breeders' Association, Columbus, Ohio, January 15, 1907.

become a fact of general knowledge among practitioners of medicine that even structures in which the circulation is very low or entirely absent—like the hair and nails—may furnish by their varying character both an index of the immediate bodily state and a record of what it has been for some time past.

With these facts in mind the breeder need not be told that the presence of any disease is a disqualifying condition in an animal from which the largest profit or the highest type of progeny is expected, and that animals affected, especially with chronic diseases, should not be used for breeding purposes until they have been restored to health.

When sheep and cattle, for example, are affected with scabies, it is something more than the wool and the skin that suffer. The drain on the whole system; the absorption of noxious material from the injured skin; the constant itching discomfort caused by the scab mite, to say nothing of the danger that the disease may be transferred directly by contact from the parent to the offspring, are conditions that must be taken into consideration, because they combine to narrow the margin between the cost of production and the market value. It is the realization of this fact that is behind the investigations of the Bureau of Animal Industry to discover the best and most economical remedy for scabies.

The same is true of most diseases and parasites with which animals are affected and adverse conditions to which they are exposed. The losses caused by the cattle tick in the Southern States are so great that an attempt to state the amount in figures would be equivalent to inviting criticism for exaggeration; and if it were possible to determine the total value destroyed by internal and external parasites—a large percentage of which can and should eventually be saved by a proper cooperation between the breeders of animals, the National Department of Agriculture, through its Bureau of Animal Industry, and other establishments for the investigation of animal diseases—a loss would be shown that is incredibly great.

LOSSES FROM PARASITES.

A parasite does not confine its activity to feeding at the expense of its host. With some parasites, like the bacteria that cause infectious diseases, the injurious effect on the host is so apparent that in comparison the nourishment abstracted by the parasites is lost sight of or is entirely ignored. With the larger parasites the injury done in addition to the absorption of food is not so apparent, but it is for that reason none the less real, as anyone can testify who has made careful post-mortem examinations of young animals, especially lambs and pigs, and has frequently found no other cause for death than stomachs, intestines, lungs, or livers crowded with worms.

In its effects on the profits of the owner, the presence of parasites in or on the body of an animal may be compared to a leak from a barrel of valuable fluid. A light infestation, like a small leak, represents a small loss; an excessive infestation, like a leak that shortly drains the barrel, means rapid and great loss. But the comparison is not perfect; there is this difference: In the case of the barrel the leak is not communicated to other barrels, while the presence of parasites in one animal is the certain means of their introduction into other animals.

Facts of this kind are so generally known that it seems hardly necessary to restate them until we inquire about their practical application for the improvement of the animal industry of the country, and hence for the insurance and increase of the profits derived from it.

THE NECESSITY FOR ERADICATING TUBERCULOSIS.

If the knowledge we have of infestation with parasites and infectious diseases was as generally applied as it should be, we would not long remain in a position to regret that an infectious disease like tuberculosis, that is strictly preventable, should be common even in herds of purebred cattle. How common it is was illustrated recently by a well-known breeder who undertook to gather a lot of purebred cattle for shipment to Argentina, and found, on applying the tuberculin test, that 50 per cent of those selected reacted because they were affected with tuberculosis. Cattle from the United States are not eligible for importation for breeding purposes to Argentina, Canada, Uruguay, and Japan until they have withstood the tuberculin test. Great Britain admits our cattle and sheep only for slaughter within ten days after arrival at the docks where they are landed; and most European countries practically exclude our cattle and other live stock. The reason given for these restrictions on our export trade is the existence of contagious diseases among our animals, and in order to secure the removal of such restrictions we should eradicate the diseases and demonstrate to foreign countries that they risk nothing by exposing their animals to ours.

A PRACTICAL METHOD OF FREEING HERDS FROM TUBERCULOSIS.

Breeders of cattle whose herds are affected with tuberculosis should adopt some system of management that will eventually eliminate the disease. A system that was practiced at the Bureau of Animal Industry Experiment Station, when some of the cattle were found about nine years ago to be tuberculous, proved both economical and successful. All the cattle were tested with tuberculin, and those that reacted were immediately separated from those that did not

react. The healthy cattle were placed in stables that had recently been disinfected with a solution of corrosive sublimate—1 part of sublimate to 750 of water—and were afterwards kept strictly separated from all tuberculous cattle and all cattle that had not successfully passed the tuberculin test. Whenever additional animals were purchased they were placed in a separate, special inclosure or stable and tested with tuberculin before they were allowed to come in contact with the nontuberculous cattle. Tuberculin tests of the non-affected cattle were made about every six months, and in eight years only one case of tuberculosis developed in the herd, which numbered at different times from 25 to 100 individuals. The one case was a bull that was occasionally used to serve tuberculous cows; and he illustrates how slight an exposure is sufficient to transmit tuberculosis from animal to animal, rather than any failure in this system of cleaning a herd and protecting it afterwards against the introduction of infection. Calves produced by the tuberculous cows were left with their mothers until they were ready to wean, and then placed in a separate pen for a period of from forty-five to ninety days before they were tested with tuberculin, and if they failed to react—which was the rule rather than the exception—they were treated as healthy stock, and afterwards invariably remained free from tuberculosis. The period allowed to elapse after removal from an infected environment before making the tuberculin test is believed to be necessary, because it has been shown at the station that animals tested directly or shortly after removal from exposure to tuberculosis may fail to react, but when retested several weeks later occasionally react and are then found to be affected.

The freedom from infection of the calves produced and suckled by the tuberculous cows is somewhat surprising. It may be explained on the basis of insusceptibility during the period when the young animals live exclusively on an animal diet (the milk of their mothers), or to the fact that tubercle bacilli are rarely secreted with milk in the absence of udder disease. The question is one that can not be discussed at greater length at the present time.

This work was done on a farm, the total area of which during the greater part of the time was less than 20 and never more than 50 acres, and on which were kept during the whole time a large number of animals affected with natural tuberculosis as well as tuberculosis intentionally induced for purposes of investigation.

There are no valid reasons why a similar system for freeing their herds from tuberculosis should not be attempted by all breeders of cattle who have sustained losses through this affection, even if they are opposed to undertaking more strenuous means. If breeders insisted simply that all animals for introduction into their herds should

be purchased subject to the tuberculin test it would undoubtedly improve the condition relative to tuberculosis in a short time to a surprising extent.

It must be borne in mind here, too, that tuberculosis is an insidious, chronic affection, which, if it has once presented itself and nothing is done to check it, will cause ever-increasing losses that must ultimately lead to bankruptcy. It is strictly progressive, absolutely sure, and will not die out unless it is opposed. It is not like the acute affections that run a rapid course, cause great destruction and loss, and then disappear; nor is it like some parasitic conditions that are responsible for a constant but not greatly varying or increasing leakage of profit.

TUBERCULOSIS AND HOG BREEDING.

Tuberculosis has also an important significance in connection with hog breeding, as hogs and cattle are exposed to each other in many ways, and both species are susceptible to the affection. It is being reported among hogs with increasing frequency, and the packers have become alarmed at the large number of condemnations of hogs for tuberculosis in the meat-inspection service. Tuberculosis in hogs is commonly a more acute disease and becomes more rapidly generalized than is the case with cattle. There are satisfactory reasons for believing that its existence among hogs is almost if not entirely due to their direct and indirect exposure to tuberculous cattle, and that its elimination from cattle will speedily be followed by its disappearance from among hogs.

DANGER FROM THE INTERMINGLING OF ANIMALS AT LIVE-STOCK SHOWS.

There is another matter to which special attention should be called. Heretofore at live-stock shows each breeder has exhibited his animals separately, keeping them away from other animals. Recently the English custom of having all animals in each class exhibited and stalled together has been quite largely adopted in this country. This method of stabling by classes instead of by owners is one of the best imaginable ways for spreading disease. An illustration of the results of the practice is afforded by Guernsey cattle from the island of Guernsey, where tuberculosis did not formerly exist, having developed tuberculosis by being shown at English fairs where they were stabled with English cattle, among which tuberculosis was quite common.

This method of exhibition should be emphatically discouraged and condemned, because it is not only the communication of tuberculosis that is to be feared, but likewise the communication of other infectious diseases and parasitic conditions. The greater ease with which

different animals of the same class can be compared is not a sufficient advantage to compensate for the dangers that underlie the miscellaneous exposure of the individuals from different herds to each other.

A LESSON FROM BRITISH HERDS.

Relative to the tuberculosis among the cattle of Great Britain and the Channel Islands the following record is interesting. In the years 1901 and 1902 the United States Department of Agriculture tested 377 Guernsey and Jersey cattle on the islands, and out of the lot only one showed a temperature reaction indicative of tuberculosis, and, as the animal that seemed to react was not killed and examined post-mortem, it can not be positively asserted that it was actually affected. In contrast, among 99 Guernsey and Jersey cattle tested by the Department during the same years in England 30 reactions were obtained, indicating that nearly one-third of the same breeds of cattle that are free from tuberculosis in their native islands are affected in England. The number of tuberculous animals among 1,278 cattle of all breeds tested in England and Ireland by the United States Department of Agriculture in the years 1901 and 1902 was 229, or 17.92 per cent. The extent to which English herds are diseased varies greatly with different breeds. It has already been pointed out that nearly 30 per cent of the English Guernseys and Jerseys tested were found tuberculous. Our inspector found that the percentage in 1901 and 1902 for Shorthorns was 23 $\frac{1}{4}$, and this figure is borne out by that obtained by the Canadian inspector in Great Britain, whose figure for Shorthorns was 23 per cent. These percentages, it must be remembered, were obtained with cattle offered for export to the United States and Canada, and show that it is necessary to insist that cattle should be required to pass the tuberculin test before they are allowed to enter this country.

The condition in some herds in England early in 1902 was found to be so bad that Doctor Salmon, at that time Chief of the Bureau of Animal Industry, issued instructions to the United States inspector in Great Britain not to test cattle intended for shipment to this country from a number of badly diseased herds until they had been cleaned. The English method of exhibiting cattle at shows is undoubtedly responsible in a great measure for the extensive infection of English herds. This and the movement of cattle from herd to herd without subjecting them to a tuberculin test are among the most important factors in the dissemination of tuberculosis among cattle.

EFFECT OF THE QUARANTINE REGULATIONS IN PREVENTING DISEASE.

Right here it may be advisable to say a few words about our national quarantine regulations. The need of stringent regulations

to protect our animal industry and the breeders of animals against loss is only too well shown by the history of contagious pleuropneumonia and foot-and-mouth disease. These diseases were effectually stamped out after their introduction, but at a great expense and after having caused enormous losses. It does not seem to be clear in the minds of some breeders that the harm done by infectious and contagious diseases is very much the same whether the diseases are acute or chronic, and hence there has been some opposition to the regulations regarding tuberculosis and the application of the tuberculin test. The difference between tuberculosis and a more acute affection like contagious pleuropneumonia is due mainly to the fact that the one reaches a certain end slowly, gradually, insidiously, and the other rapidly and visibly. If no measures were taken against the spread of tuberculosis and to prevent its importation from foreign countries, it would still require some time before the utter ruin of our cattle industry was completed, but the end would as certainly be ruin as with other more acute affections were they allowed to operate and spread without restraint.

There is one condition that our quarantine regulations effect that is little thought of. When we quarantine against certain diseases that are prevalent in the countries from which we import animals for breeding purposes, we are strictly practicing a system of selection, and the character selected is disease resistance. Where the importations amount to so small a percentage of the stock already in the country, as in our case, this selection of disease resistance will produce results of insufficient magnitude to be a determinable quantity, unless it be after a very long time. But there is a practical side to it; it points the way for the breeder to follow. If he should apply the same tests to every new animal introduced into his herd or flock that are required by the Federal Government before animals can enter the country, we would soon have established a system of selecting disease-resistant animals that would bear rich fruit. It requires the cooperation of many men to produce great results, and it is hoped that many men, breeders of purebred as well as of other stock, if they are not now practicing a system of selection like the one here indicated, will lend their aid by adopting some such system at once, both for the general good of American animal industry and because it will protect their immediate interests.

THE RELATION OF HEREDITY TO DISEASE.

The term selection suggests the relation of heredity to disease. When we examine the views expressed by writers on the subject of inheritance, we find that they range from the conviction that all diseases are to some extent heritable to the belief that all diseases are the result of exposure to environment. It is not intended in

this paper to favor one extreme or the other, or to draw a line between the two; but attention is called to a thing intimately associated with disease that is certainly transmitted by organisms to their progeny, namely, susceptibility to disease.

Susceptibility means simply that an animal is liable to contract certain diseases or to harbor certain parasites when it is subjected to a certain environment. When hogs are exposed to hog cholera they almost invariably become affected; the same exposure means nothing to cattle. If the exposure is to blackleg or Texas fever, the cattle suffer and the hogs are not endangered. Hence, hogs are susceptible to hog cholera and cattle to Texas fever and blackleg; and this susceptibility of the hogs to the one affection and of the cattle to the other two is so nearly a uniform condition with all the individuals of each species that no explanation is conceivable which does not recognize it as a specific, hereditary character.

Nothing that pertains to an organism can appear in all, or practically all, the individuals of the species with so much constancy as the susceptibility of hogs to cholera and cattle to Texas fever without requiring that it be classed as a specific, hereditary character. A hog naturally insusceptible to hog cholera or a cow to Texas fever is no less remarkable than an organism that varies greatly from its progenitors and other individuals of its species in some superficially visible manner; and a hog susceptible to Texas fever or a cow to hog cholera, in the light of our present knowledge, would be a surprising sport. Hence this susceptibility for certain diseases and parasites is remarkably specialized. Just as hog cholera and several other hog infections are hog specialties, so also are hog lice and several other hog parasites hog specialties; and this holds true with the diseases and parasites of horses, cattle, sheep, poultry, etc.

The specific susceptibility of animals to diseases and parasitic conditions has received too little attention in selective breeding. It is a varying character and therefore should be capable of modification by selection like other varying characters, though its selection offers some difficulties, as it frequently involves the destruction of a large number of animals in a way that makes their bodies unfit for food and most other economic purposes. But the question has sides that should receive attention and could be attended to without much loss or trouble. For example, the degree of susceptibility to harbor intestinal parasites could be determined by macroscopic and simple microscopic examinations of feces, and only those animals used for breeding that show the greatest freedom from such parasites.

EXPERIMENTAL WORK IN SELECTIVE BREEDING.

At the Experiment Station of the Bureau of Animal Industry the susceptibility of many hogs to hog cholera has been tested during the

last ten years in connection with the regular, systematic investigations of hog diseases, and it was discovered that it varies from extremely high susceptibility to absolute immunity. A similar variation in the susceptibility of animals to parasites peculiar to their species has also been observed. Among hogs approximately 1 per cent are immune from cholera. The difference in susceptibility of cattle to Texas fever varies so much that some cattle suffer only a very mild, barely determinable attack from the same exposure that is rapidly fatal to other cattle; and this difference of susceptibility was found to be independent of visible vigor, or lack of it, in the exposed animals. The same statement can be made regarding black-leg and tuberculosis, and probably, if our experience were more general, could be made of the whole category of infectious diseases.

Among cattle one cow was actually found on which cattle ticks would not grow and several cows on which they grew only sparingly under conditions that caused extreme infestation of other similarly exposed cattle. This is all the more remarkable as cattle are not the exclusive, but only the greatly preferred, host of cattle ticks.

The efforts made at the Bureau Experiment Station to grow hogs immune against hog cholera by breeding artificially immunized hogs ended in absolute failure. The progeny of the immunized hogs showed no modification or reduction of susceptibility. The work recently begun to obtain a breed of immune hogs by breeding from naturally immune stock has not progressed far enough to justify drawing conclusions. One litter of five pigs produced by a naturally immune sow with a naturally immune boar were tested and found to be immune; a second litter of five pigs produced by the same sow and boar when they were exposed to infection all contracted cholera and died.

An attempt to produce an immune race or breed of hogs by selecting naturally immune animals seems more promising than the selection of artificially immunized animals, because there are many reasons for believing that so-called natural or spontaneous variations are more freely transmitted by heredity than induced modifications.

Experiments are also in progress to determine the precautions to be taken to raise lambs free from parasites. The precautions, until a worm-free flock of sheep has been established, will require thought, labor, and expense; but once such a flock has been established the increased profits it will yield in finer, more rapidly developing animals will prove a very satisfactory compensation for the price paid to get it.

Recently extensive investigations have been started by the Bureau to gain additional information on many other phenomena of special interest to breeders of animals. An attempt is being made to solve

some of the complex problems of heredity; to determine how the Mendelian law of heredity applies to animals; to learn the true significance of inbreeding; to discover the hereditary value of functionally acquired modifications, etc.

The establishment of immune breeds of animals will be a slow process; even if success finally rewards our efforts it will be a long time before practical benefit can be derived by breeders and consumers of animals. For the present we should make every effort to free our herds and flocks from disease, and once we have them free, to keep them so. What has been said about tuberculosis is an illustration of what can be done at no great expense. One breeder has expressed his intention to establish a herd of purebred cattle, free from tuberculosis, and to advertise it extensively as such.

CONDEMNED ANIMALS AT ABATTOIRS.

Sooner or later measures will be adopted by the purchasers of live stock condemned at stock yards and abattoirs to trace the diseased animals to their former owners, and to make the latter responsible for the loss represented. The matter is being agitated now by the packing firms. At present the larger purchasers—the large butchering and meat-packing establishments—seemingly lose when animals are condemned after purchase either before or after slaughter, but this is only a fiction. The loss is now divided either among all the breeders and feeders who have animals to sell or among the consumers of animal products, as no great business establishment would fail to take into account its probable losses from definite causes like an inspector's condemnation of diseased or unfit carcasses. This loss is carefully calculated, and a correspondingly lower price given for all animals offered for sale by breeders and feeders, or a correspondingly higher price exacted from the consumer, or perhaps both. When means are adopted to make each man responsible for the loss due to disease among the animals he sells, the breeder who has not prepared himself to meet the new conditions will be in an unenviable position.

The Bureau of Animal Industry can do and is doing much, but the bulk of its work for the benefit of the animal breeder and feeder now is, and always must remain, that of an agent for devising, discovering, and suggesting means for increased safety and general improvement. It is hoped that the Bureau will have the hearty cooperation in its work of all breeders of animals, and through them the cooperation of the States, because this support and cooperation is needed in order that it may serve the breeders especially, and the public generally, to the best advantage.

THE DANISH HOG INDUSTRY.*

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INTRODUCTION.

The economic value of the hog in Denmark is now so great that we are prone to suppose that it was always so. The fact is, however, that the hog industry in that country in its present highly developed form is of quite modern growth. Until well into the nineteenth century Danish hogs had to shift for themselves, and found their principal nourishment in grass, acorns, and beechnuts. Hog raising at that time was as closely connected with the field and forest as it is now with the creamery industry. Forests were valued according to the number of hogs they could maintain, and this old method of valuation still obtains in taxing the few square miles of inclosed forests that still remain. However wretched was the condition of the hogs at that period, they seem to have fared no worse in Denmark than in most of the other European countries. On the contrary, the Danes were among the first to pay any special attention to hogs. Still the Danish hog did not show many signs of improvement in the early part of the nineteenth century. It had coarse joints, rough skin, was restless and unthrifty, and quite different from what we now require of a bacon hog. But in passing judgment on those hogs we must not forget that only rough and hardy animals could have roamed about and shifted for themselves the greater part of the year and endured the hard lot to which they were exposed, and that the high-bred modern hog would have sickened and died under such conditions. Before the land was allotted and the separate owners hedged in their own lands, at the beginning of the nineteenth century, all domestic animals roamed at large. After this change they were obliged to herd

* The information presented in this article has been gathered from a variety of sources, chiefly of an official nature. The portion relating to the history of the Danish hog industry is largely based on the writings of P. A. Mørkeberg, the state adviser in hog breeding to the Danish Government. The data on methods of salting bacon are derived from reports issued by the Danish "Royal Veterinary and Agricultural School Laboratory for Agricultural Experiments." Much other information has been obtained from the annual reports of the Royal Agricultural Society of Denmark and from Danish cooperative and other agricultural papers.

or tether them and ring them to prevent their rooting. But the decrease in forests would of itself have reduced the number of hogs if other causes had not led to the further development of the industry.

Before systematic keeping and feeding of hogs had come into vogue, hog raising was looked upon as a source of doubtful profit. After the land allotment a peasant would keep two or three hogs only, seldom more. But conditions have since changed. Hog raising is now profitable, and a peasant who keeps many hogs and knows how to feed them is on the highway to prosperity.

EARLY DANISH BREEDS OF HOGS.

We are informed by P. A. Mørkeberg, State adviser in hog breeding to the Danish Government, that in the early part of the last century Denmark had two breeds of hogs—the Jutland and the Zeeland, the latter otherwise known as the Island breed. The former were tall and precocious, had long bodies and legs, a sharp, arched back, and drooping ears. The Zeeland (or Island) breed was small, with compact body and erect ears and heavy mane bristles along the back. Both breeds were easily kept and subsisted for the greater part of the year on what they found in the field or forest. Neither breed has continued in a pure state to the present time, as they proved unsuitable for modern purposes. They were too slow to mature and did not have the form wanted in the modern slaughterhouse—that is, large hams and thick sides.

In the beginning of the nineteenth century Denmark produced a comparatively large number of hogs and exported some. Erik Viborg, professor in the veterinary school at Copenhagen, is authority for the statement that Jutland alone exported yearly more than 10,000 hogs and 1,280,000 pounds of pork. An average weight of 180 pounds per head would make this an annual export of about 3,000,000 pounds. Of the native Jutland hogs many were bought up and driven south into the so-called marsh country along the ocean north of the Elbe. But it is not possible to say how many were taken away annually. Buyers called “Prangere” bought up the hogs and drove them in herds from town to town and from district to district, constantly increasing the herd on the way. This trade continued till Denmark lost the provinces of Schleswig and Holstein in 1864.

Importations of English breeds commenced about the beginning of the nineteenth century. Other importations came from Holstein and Mecklenburg, and as these were partly of English blood the movement made for improvement tended in the same direction.

In the second quarter of the century the Danes paid more attention to hog breeding. They imported a number of foreign hogs of

different breeds, which they kept pure or crossed with the local breeds. The object was to render their own stock more contented and easily kept, but the foreign breeds were smaller than the native hogs. Thus, by the middle of the century, foreign blood had come into the country in different ways. Almost every locality could show different shades of breeding, due to the numerous sources of origin. No general breed, however, prevailed in the country. Although these animals of the mixed breeds did not attain the size of the old Danish breed, they were more easily kept and matured more rapidly.

CROSSING WITH ENGLISH BREEDS.

Hr. Mørkeberg, the Danish hog expert previously mentioned, assumes that in 1850 the old Danish breeds still existed generally throughout the country and that the improved breeds were found only in a few localities. But soon after the middle of the century the dairy industry began to develop, and this brought about changes in the hog industry as well. The dairy industry yielded a rich and abundant supply of feed that was eminently suitable for producing bacon. Crossing with English boars was especially successful, and this brought about a growing demand for English breeding animals. These crosses would often attain a weight of 200 pounds in seven or eight months and 300 pounds before the end of the first year. The rapid development of these crossbred animals as compared with the slow growth of the native breed increased the demand for English breeding hogs to such an extent that the census of 1871 shows 1,064 English as against 1,072 Danish boars in the entire country. These English boars were not all imported direct. Enterprising Danish breeders would import a boar and a few sows and form breeding stations. From these stations purebred stock spread over the country by hundreds. Thus, on the estate of Henneberg there existed an important breeding station from 1874 to 1886. Beginning with one boar and three sows of the Middle White Yorkshire breed, this station alone disposed of some 300 boars and 400 sows and had a determining influence in developing the hogs in Fyen and Jutland. Thus, although the imports of English hogs were most numerous during the years 1852 to 1863, the English influence on Danish hogs was doubtless greater in succeeding years when purebred stock multiplied in the country itself.

Toward the close of the seventies Denmark possessed a good breed of hog well adapted to the local conditions and satisfactory to the Hamburg market, which it then supplied. This market demanded a so-called fat hog of 250 to 300 pounds live weight. But a lack of uniformity characterized the hogs of this period at the exhibitions. Almost as many types were shown as there were hogs, and it was

necessary to warn breeders of the fact that every cross was not necessarily an improvement. Although they all bred for the same purpose, they made use of several breeds, which shows that they had not learned to specialize the industry.

A change in the method of breeding occurred about 1880, resulting from a change in the market conditions. England began more and more to buy Danish bacon. The demand was for hogs weighing from 160 to 200 pounds. The hogs shipped to Germany were too fat, so a new system of crossing took place to supply this demand, and gradually Denmark shifted from the Middle White Yorkshires to the Large White Yorkshires. This crossing was most successful in the district of Holstebro, where, as it happened, the old Danish breed still remained almost intact. The new cross proved successful and the bacon from this district was in great demand in the London market. The farmers made an effort to get rid of their fat hogs and to replace them with the so-called Holstebro breed. As their hogs were often of a mixed nature the farmers adjusted themselves to the best market and sold fat hogs to Germany and bacon to England. Some fat hogs, too, found a market in middle England. Farmers also counted on the possible revival of the German trade, but with the German prohibition of 1896 England remained the only market and this also simplified the breeding problem.

PLAN TO PRODUCE A MODERN DANISH HOG.

The method of breeding so far followed by the Danes was to improve their own breed by the continuous crossing rather than take full advantage of the native breed of hogs. The breeders had made no rational attempt to combine the best qualities of the Danish and English breeds; they had simply kept on crossing in the hope of getting a better product. Before they could make any further progress they had to have a definite object toward which they could work. Accordingly, in the early nineties, after a thorough investigation of the prevailing conditions, the breeders adopted the following three-fold plan:

1. The formation of a modern Danish breed.
2. The production of commercial hogs by means of crossing.
3. The establishment of breeding centers.

The principal object was to form a Danish breed. The old Jutland hog was to form the basis of this breed, and its value began to be appreciated more fully, as the coarser strain was fast disappearing. It was high time to save the remnant that still existed in places where the crossing process had not proceeded too far. Often it was necessary to retrace the steps and regain what had been lost by overcrossing. The breeders believed that they would be able to retain the outward form of the old Jutland breed and that it could be improved

in course of time so as to be satisfactory to producers and packers. Instead of continuing the crossing, they purposed to produce by systematic breeding a type like the old Jutland breed with qualities that should be satisfactory to the market. Their object was to produce a "sound, robust, and hardy animal that should possess the requisite form and size, that could easily be fattened, and could bring forth a strong and numerous offspring." In this way they expected to be able to obtain suitable material for a future Danish breed.

The native breed had many excellent qualities. It was fully acclimated and had the size and the long form the packers demanded. It was likewise thrifty and fertile. But it also had serious defects that rendered it unfit for the packing houses. The hide and bones were coarse, the belly meat was thin, the fat thick, and the hams small. In course of time the breeders hoped to overcome these defects by rational breeding and care, and thus be able to satisfy the demands of the market. Their ultimate purpose was to form from this stock a breed that would satisfy producers and consumers as regards form and quality. The use of Yorkshire boars was to be temporary and to continue only until the native breed should supply a first-class product and be acceptable to the packing houses.

The plan required that the two breeds be kept pure and separate. This brought about the establishment of breeding centers for both breeds which were placed under strict government control. A state adviser, expert in hog breeding, with seven assistants, one for each district, directs the hog breeding of the country. Each district has a committee of three members to select the animals used for breeding purposes. Of this committee the minister of agriculture chooses the chairman, the general agricultural society of the district the second member, and the representatives of the packing houses the third.

The breeding is based upon a carefully elaborated system of records. The effort is made to express in figures as far as possible the degree of success attained in producing certain qualities. As the plan had already been discussed and approved in the local agricultural societies, it found ready acceptance, and the farmers have worked zealously to make it a success. How far they have succeeded in their efforts to improve the native breed we may judge from the fact that ever since 1901 considerable opposition to the further employment of the Yorkshires has become manifest and many farmers and some of the packing houses find that the native breed yields as good a product as the first cross.

The chairman of the committee on the selection of hogs for the breeding centers in Zealand stated in 1905 that the native breed was yielding a product suited to the British market. Thus we may assume that this interesting attempt to develop a native breed of hogs to suit a high-class trade is meeting with success.

BREEDING CENTERS.

It may be inferred from the preceding remarks that the Danes had decided that they could not hope to furnish a uniform supply of bacon except by following a uniform method of breeding throughout the country. As the practice of using Yorkshire boars became more general, it was soon apparent that it would be more economical to establish their own breeding centers to supply private breeders and breeding societies than to keep on importing large numbers from England. In any case some importation would be necessary to keep up the breed, as the Yorkshires are unable to maintain their standard in Denmark. The object of the breeding centers was, therefore, to produce purebred stock of the Large White Yorkshire and of the native Danish breed in order to supply farmers and breeding societies with purebred animals. Regarding these importations, it may be stated that in course of time there have developed distinct types of Yorkshires from animals imported at different periods. Experts claim they can distinguish three types of Yorkshires, as follows:

1. The offspring of animals imported from England long ago. These have flat snouts, erect ears, short, round bodies, and thin legs.
2. The offspring of animals imported recently from Sweden. These are large, with fairly large heads and ears, and on the whole somewhat coarser in build.
3. Animals imported from England in recent years and their offspring. These are large animals. They have large heads, hanging ears, long, round bodies, coarse legs, and abundant bristles.

It was equally necessary to establish breeding centers for the Danish breed in order to supply purebred sows to be bred with the Yorkshire boars. This purpose, however, was only incidental, the main object being to improve the Danish breed until it should be sufficiently developed to take the place of the first cross in the foreign exports of bacon. Breeding centers managed according to fixed rules would give a definiteness and stability to the breeding which the former practice of relying on private breeders lacked.

METHOD OF ORGANIZING THE CENTERS.

The breeding centers are connected with well-managed farms, the owners of which are anxious to obtain the designation "breeding centers" because it recommends their stock. These centers are under general and local supervision. Farmers desiring to have breeding centers apply to the local agricultural society, which directs a committee to inspect regularly the stock and management of their farms and after one year report to the district committee. On these reports the committee annually designates the breeding centers for the ensuing year. The centers are under the immediate supervision of

the committee of the local agricultural society. This is to prevent fancy breeders from getting the control and losing sight of the real interests of the industry. Furthermore, all breeding centers obtaining state aid are subject to the direction of the state adviser in hog breeding and his assistants. Each assistant visits two or three times a year the breeding centers in his district. They see to it that the pigs are carefully numbered, that the books are in order, and if not, give the necessary assistance. They keep a record of the pedigree, description, and, as far as the replies of the purchasers permit, a history of each animal. Since they are familiar with all the breeding centers in their respective districts, they are able to render good service in exchanging hogs between the centers.

STATE AID TO BREEDING CENTERS.

Breeding centers for Yorkshires were the first to be established. Four came into operation in 1895, and gradually the number increased until they amounted to 16 in 1901, which is also the present number. The centers are distributed in such a way as to be easily accessible to all parts of the country. As the centers of this breed sell principally boars, they are few in number compared with those of the Danish breed. In 1905 there were 16 breeding centers of the Yorkshire and 117 of the Danish breed. In 1903 the breeding centers of the Yorkshire breed sold 426 boars and 57 sows, while 107 centers of the Danish breed sold 423 boars and 2,568 sows.

REQUISITES AND RULES.

The owner of a breeding center must enter the selected animals in the herdbook and keep a list of the sows and the pigs that each sow litters. He must also keep a record of the sales and where the new owners reside. The pigs of the litter are to have the same earmark (number) as the sow.

In the centers for the Danish breed it is requisite that the sows have a good appearance, abundant milk, be able to produce a strong offspring, and to transmit these qualities to their descendants.

A series of questions were sent out to the purchasers of sows from the breeding centers to ascertain how the sows have developed, how many pigs they have littered, at what age they were delivered to the packing house, and what weight and quality they had. The replies showed that the development had been good. As to their fertility, 62 per cent of the sows in the first litter and 80 per cent in the second litter produced nine or more pigs in a litter.

When the district committees had been appointed in 1903, the chairman of these committees and the state adviser in hog breeding met and agreed upon the following rules:

1. The hogs in the breeding centers must be either of the pure Danish or of the pure Yorkshire breed.

2. The breeding center must be under the control of a committee appointed by the local agricultural society.

3. The breeding center must consist of not less than one selected boar and three selected sows.

4. The directorate of the respective local agricultural society or a committee appointed by the local agricultural society select the hogs, which must be approved by the district committee.

5. The owner must see that the breeding animals and their offspring are marked.

6. The owner of the breeding center must keep a record of pedigrees and sales. The record must be approved by the district committee.

At first only breeding centers of the Yorkshire breed received state aid. In 1898 the state voted for the first time an aid of 20,000 kroner (\$5,360) to the breeding centers. In the fiscal year 1899-1900 the breeding centers for the Yorkshires received each 360 kroner (\$96.48), while those of the Danish breed received each 160 kroner (\$42.88). In the year 1903-4 the state aid to the breeding centers for hogs was increased to 45,000 kroner (\$12,060).

To obtain recognition or state aid a center applies through the agricultural society to which it belongs to the committee of the district, which reports its decision to the ministry of agriculture. In these matters there is the heartiest cooperation between the Government and the societies, and the two seem to work in such harmony that it is hard to say where the influence of the one ceases and that of the other begins.

In the case of the breeding centers for Yorkshire the only condition attached to the state aid is that such a center must not sell animals to foreign countries. Regarding the centers for Danish hogs, the ministry specifies that the money shall be used (1) to buy breeding animals for the centers, (2) to keep animals that promise to have a good influence on the development of the Danish breed, and (3) to keep extra boars.

BREEDING SOCIETIES.

In recent years a number of societies known as breeding societies have come into existence. These societies are closely connected with the breeding centers and work in harmony with them. It has already been explained that the purpose of the breeding center was to produce Large White Yorkshire boars and Danish sows for breeding purposes. The breeding societies occupy the next stage and take the purebred animals from the breeding centers and cross them for the purpose of producing the commercial hog sold to the packing houses. The larger farmers and breeders as a rule have their own boars, but as it

would in many cases be too expensive for the small farmers to keep a purebred boar for their own use, they have combined for this purpose. As a society they can secure expert assistance in selecting the boar, and the expense of keeping it is small when it is divided among the members. The society also purposes to give directions in keeping and feeding hogs.

The first 2 societies came into existence in 1894 and the number slowly increased until there were 10 in 1898, 4 having been added in that year, the breeders by this time having recognized the importance of these organizations. When the Government granted state aid in 1899-1900 no less than 23 societies were formed in the first year. At the beginning of 1904 there were 96 societies supported by the state, with a membership of 2,088, with 114 boars. There were, besides, at least 15 societies not supported by the state.

STATE AID, QUALIFICATION OF BOARS, ETC.

The law of May 23, 1902, allows these societies a state aid of 50 kroner (\$13.40) a year when their purpose is recognized to be good and useful by the joint agricultural society and their rules are approved by the minister of agriculture. The aid is for some particular boar owned by the society in question. Boars, if of the Yorkshire breed, must be recognized as worthy of a prize either at an exhibition supported by the state or by the committee of an agricultural society. Boars of the Danish breed must come from recognized breeding centers on both sides or must have received a prize at the exhibition of a joint agricultural society. The state pays only as long as the boar is in full vigor. If a society sells the boar and buys another within two months the state aid goes on without interruption, but if the society ceases to exist before the end of the year for which it has drawn aid, the ministry of agriculture may require the restitution of all or a proportionate part of the state aid. In this case the members are responsible in a solidary manner as a society and as individuals. A society desiring state aid applies to the joint agricultural society, which may approve the application and forward it to the minister of agriculture. A society must have at least 8 members and together own 15 selected sows.

In order to show how such societies are conducted, there are given below the rules of the hog-breeding society of Terpling and vicinity (Holsted, 1905).

RULES OF A DANISH HOG-BREEDING SOCIETY.

SEC. 1. The object of the society is to produce bacon hogs that will satisfy the packers' demand for a prime product and the farmers' demand for hogs that are thrifty, hardy, and fertile.

SEC. 2. The boar must be either of the Large White Yorkshire or of the pure Danish breed (Landrace). In the latter case the boar must, on the side of both the dam and sire, come from recognized breeding centers or have received a prize at a fair or exhibition held by a general society.

SEC. 3. The sows are, as far as possible, to be of the Danish breed, and the society shall at any rate work to the end that in time they shall be of the Danish breed.

SEC. 4. The directorate or a committee of the society shall supervise the selection of sows as far as necessary and mark them according to the orders of the directorate.

SEC. 5. The keeper of the boar keeps a record of services. If a sow goes with the boar within three months of the last foregoing service, no charge is made for going with the boar. The owner must notify the keeper that she is going with the boar; neglecting to do so he is liable to pay for each service.

SEC. 6. The offspring shall have the number of the dam. In case the ministry shall recommend a definite method of marking the selected sows and the offspring this method shall be followed.

SEC. 7. The members of the society shall, as far as possible, keep a record of the age, weight, and quality of the offspring delivered at the slaughterhouse.

SEC. 8. The directorate shall inspect the hogs of the members at least once a year.

SEC. 9. The directorate consists of three members chosen for three years by the general meeting. One member withdraws each year, the first two years by lots, thereafter by turns. The meeting may reelect a retiring officer. The directorate elects its own chairman, who keeps the accounts, presides over the directorate and the general meeting, decides the time and place, and calls the meetings.

SEC. 10. The directorate procures stations and disposes of the boars and, in general, looks after the interests of the society.

SEC. 11. The regular general meeting takes place in March after one week's notice. Here the accounts, after being revised by an auditor chosen for one year by the general meeting, are presented, the officers elected, and the price of service fixed.

SEC. 12. The members are responsible individually and as a society in proportion to the number of sows entered. A member may withdraw from the society on the 1st of April by notifying the president in writing six months in advance. After the notification the withdrawing member has no vote in the society. If the society is in debt, he is obliged to pay a proportionate share, but he has no claim on the property of the society. In case a farm is transferred the rights and obligations pass to the next owner.

SEC. 13. The society may be dissolved only when not less than two-thirds of the members thus decide. The members divide the debts or possessions in the same proportion as they are liable in the society.

N. B.—In order to obtain State aid the society must have at least 8 members and 15 selected sows.

DANISH METHODS OF SALTING BACON.

THE FLOOR-SALTING METHOD.

Three methods of salting bacon have been in vogue in Denmark. The principal difference lies in the length of time consumed in the process. The prevalent method is the so-called floor-salting. The

necessary apparatus is a force pump and a rubber hose supplied with a sharp nozzle. The nozzle is thrust into the bacon in from 15 to 20 places, according to the size of the side, and the pump forces the brine into the bacon. A manometer indicates the amount of pressure. Thereupon salt and saltpeter are rubbed on the surface and the bacon is stacked on the floor to mature. Some of the brine oozes out under the pressure of the weight. The bacon lies in the stack eight or ten days and the salt rubbed into it turns into brine. It is then ripe. Four sides, or about 200 pounds, are sewed together into gunny and called a bale, and the bacon is ready for export. The time consumed from slaughtering to shipping by this method of curing varies from ten to twelve days.

THE AUTO-CURE METHOD.

There are shorter methods. One of these is the auto-cure method used in the packing houses belonging to one of the principal stock companies engaged in this business. In the first place the sides are prepared and the brine is injected by means of a force pump, as described above. Then the sides are piled on trucks supplied with light shelves and are rolled into a huge cylinder made of sheets of iron and holding about 240 sides. The open end can be securely closed with a cast-iron door. When the cylinder is full and the door bolted a partial vacuum is produced for about one hour for the purpose of opening the pores to let undesirable odors escape from the bacon and to allow the brine to be taken up later. The cylinder is then filled with brine and a pressure of 120 pounds to the square inch applied for five hours. So far the process has continued from eight to ten hours. The brine is then drawn off and the bacon is taken out, sprinkled with salt, and stacked in the cooling room, where it ripens in from two to five days.

This method is, of course, much more expensive than the floor-salting method. Besides the cylinder it requires force and suction pumps and large reservoirs for holding the brine. But the brine can be used several times, so long as it is clean; the waste is made up and the strength maintained by fresh additions.

THE INJECTION METHOD.

The object of this method is likewise to reduce the time required for curing the bacon. J. Morgan, of Dublin, Ireland, invented this method and introduced it into England and France some forty-five years ago. In 1897 the Odense export packing house adopted it. The procedure is as follows: A bullet in the brain kills the hog; the scalding, scraping, and singeing follow. Then the chest is opened and an incision is made into the left chamber of the heart and a small

tube connected with a force pump is introduced. As the right chamber of the heart is opened, the pump forces the brine through the arteries, capillary vessels, and veins, and drives before it the blood. First the blood streams out, then blood and brine, and lastly pure brine. The pump is then stopped and the large blood vessels about the heart are tied up. Thereupon the bowels are removed, and after the carcass has cooled off it is cut up, salt is rubbed in, and it is stacked away to mature as in the former instances. The entire process occupies four or five days.

Here the salting takes place from within. That this method drains the blood thoroughly from the system appears from the fact that bacon treated in this way is generally lighter in color than other bacon. All the parts of the carcass are salted at the same time and alike, as, for example, the liver and the tenderloin. But there are drawbacks to this method. If the bullet pierces or injures one of the larger blood vessels, the brine fails to expel the blood or to cure that part of the system.

SMOKING DANISH BACON IN ENGLAND.

The English wholesale dealers smoke most of the Danish bacon that comes to England. The smoking is an important part of the work, as it imparts to the bacon a particular flavor. The English smoking is supposed to give the flavor desired in England. Danes residing in England have complained that when visiting Denmark they can not get as good Danish bacon as in England, and have attributed the defect to the manner of frying; but expert judges maintain that the secret lies in the smoking.

The practice in England is to wash and dry the sides carefully and sprinkle them with pea meal, which improves their appearance. Thereupon the sides are hung in a high room or smokehouse, the floor of which is covered with a layer of hard-wood sawdust. As the sawdust smolders a fragrant smoke fills the room. An experienced man regulates the heat and smoke and removes the sides at the right time. After cooling off in the packing loft the bacon is baled for the market.

COOPERATIVE PACKING HOUSES IN DENMARK.

In 1905 there were 54 packing houses in Denmark. Twenty-four of these were private establishments and 30 were cooperative; the latter had in that year a membership of 68,000.

The exports of products from Danish packing houses in 1901 were as follows:

	Pounds.
Bacon and hams, fresh.....	1, 130, 000
Bacon and hams, salted or smoked.....	119, 370, 000
Beef, fresh.....	22, 870, 000

	Pounds.
Beef, salted or smoked.....	1, 450, 000
Mutton, fresh.....	730, 000
Mutton, salted or smoked.....	10, 000
Sausage, tongue, fat, lard.....	2, 330, 000
Other animal products.....	12, 380, 000
Total.....	160, 270, 000
Value.....	\$19, 735, 500

The cooperative packing houses rank second among the Danish cooperative societies (the dairies being first) and are a remarkable feature of Danish agriculture. In Denmark there are cooperative establishments in almost every industry. These cooperative societies are often in turn associated into larger bodies. This is the case in horse breeding, cattle breeding, hog breeding, poultry breeding, milk production, seed improvement, agricultural machinery and implements, agricultural credit, insurance, etc. No special law or regulation governs the cooperative societies. When the farmers see fit to form a society of any kind, they are at liberty to organize and make regulations. They do not have to obtain any previous consent of the state nor to publish the organization. The civil law, as well as the rules and conditions signed by the members, apply to the financial responsibility. The state exercises supervision and gives aid to societies that comply with certain prescribed conditions. In this way there have grown up certain types of rules and regulations. The Danes consider it a great advantage also that the rules may be changed from time to time in accordance with the free development of the cooperative societies.

As for adopting these cooperative societies in other countries, it would be important to consider whether the cooperative spirit has sufficiently penetrated the mass of the people and what experience and education they have had in cooperation. For an agricultural area of 500 square miles and a rural population of about 900,000 there were in 1903 in Denmark 19 special high schools in agriculture, dairying, and gardening, 28 popular high schools giving instruction in agriculture, and 51 ordinary high schools of domestic economy, or in all 98 schools giving instruction of a practical kind. Most of these schools, furthermore, give short courses, winter and summer, for those who can not spare the time to attend the regular courses.

The cooperative packing house of Horsens was the first of this type to be established in Denmark and went into operation in 1887. In the first year it had a membership of 1,218 and killed 24,000 hogs. In 1901 it slaughtered 38,462 hogs; in 1902, 45,548 hogs, and in 1903, 52,802 hogs. In 1902 the surplus paid the members at the close of the year amounted to 220,039 kroner (\$58,970), or 94 cents per 100 pounds.

The following table shows the growth of the cooperative packing houses:

Annual status of cooperative packing houses in Denmark and number and value of hogs killed, 1888 to 1903.

Year.	Number of cooperative packing houses.	Number of hogs killed.	Value of hogs killed.	Year.	Number of cooperative packing houses.	Number of hogs killed.	Value of hogs killed.
1888	1	23,407	\$277,000	1896	20	626,854	\$6,813,000
1889	8	181,548	1,591,000	1897	25	583,420	7,874,000
1890	10	147,455	2,112,000	1898	26	601,089	7,908,000
1891	14	269,748	3,674,000	1899	26	729,171	8,434,000
1892	14	297,641	4,677,000	1900	26	660,000	9,334,000
1893	14	317,785	5,178,000	1901	26	651,261	10,273,000
1894	15	385,731	5,421,000	1902	27	777,232	12,166,000
1896	17	528,811	6,196,000	1903	30	928,798	.....

METHOD OF ORGANIZING A COOPERATIVE PACKING HOUSE.

It is interesting to note how the Danes went about organizing a cooperative packing-house society. It was necessary first of all to find a suitable locality that could supply to the packing house at least 10,000 hogs a year. The location should be convenient for the territory from which the packing house was to draw its supply of hogs and at the same time be connected by railway or steamship line with a shipping center. Furthermore, it was advantageous to be in the neighborhood of a large city where the by-products of the packing house could be profitably disposed of. The number of hogs that could be counted upon determined the size of the packing house. In course of time as the industry increased the original structures would be remodeled and enlarged.

Persons interested in the project would call meetings of the farmers by parishes, and experts from the Royal Danish Agricultural Society would explain the working of the system and the technical points of the industry. But before they could go on with the work it was necessary to secure sufficient capital to construct the plant and a guaranty that the farmers would furnish hogs enough to keep it busy when it was ready. At first many farmers were cautious and hesitated to take part in an enterprise of this magnitude, but as soon as it proved successful they were only too eager to join and support the society in every way. In a few cases sufficient funds could be obtained among the members themselves or from local merchants, but as a rule they borrowed from savings banks. The payments usually extended over a period of from twenty to thirty years, the interest and a part of the principal being paid annually. The rate of interest on the long loans varied from $3\frac{1}{2}$ to $4\frac{1}{2}$ per cent per annum.

In order to obtain the money the cooperative members individually and as a society would have to guarantee the payment. The organi-

zation committee would apportion the sum guaranteed among the members according to the size of their farms. Farmers having less than 1 tönne hart korn (about 24½ acres) would guarantee not less than 50 kroner (\$13.40); those having more than 1 and less than 10 tönner hart korn (24½ acres), 100 kroner (\$26.80), and so on, 100 kroner for every 10 tönner hart korn, but no single member could guarantee more than 500 kroner (\$134), and only persons supplying hogs could be guarantors.

With regard to the guaranty it is a fundamental principle that the guarantors are the owners of the property in proportion to the amount guaranteed. As soon as the loan is paid the members own the packing house in proportion to the value of the hogs that they have delivered. As the guarantors and members are the same persons and as they probably guarantee in proportion to the value of the hogs they deliver, the seeming contradiction in the statements that the guarantors and the members own the packing house disappears. To secure the loan a member had to guarantee a sum apportioned according to the size of his farm. A guarantor derives no profit directly from his guaranty. His profits are based solely upon the number of hogs that he delivers.

A distinguishing feature of Danish cooperation is the absence of what we term shares. There are no shareholders deriving profit from the shares they hold irrespective of the trade they do with the society. The guarantors, or members, receive for the hogs delivered such a price as the packing house realizes, less the running expenses, the annual payment on the loan, and the amount set aside for the reserve fund. In some instances the societies borrow money on the security of the packing house only.

The cooperative members in nearly all cases pledge themselves to deliver to the packing house all the hogs of 150 to 200 pounds live weight which they produce. In this requirement, however, they do not include boars, sows, and sucking pigs sold to other members, day laborers, and artisans' families, nor hogs slaughtered for the use of the farmer himself. In order to give stability to the industry the agreement to deliver extends over a long period, from five to ten years. If a member violates this rule by selling elsewhere than to the packing house he is bound to pay a fine of 10 kroner (\$2.68) for every hog he has sold in this way. The packing-house committee enforces this rule and reports from time to time whether any member is evading the rule. Besides, the members sign in the presence of witnesses at the end of the year a form declaring that they have delivered to the packing house all the hogs reared for sale.

It sometimes happened that the packing houses found it difficult at first to obtain from the members a sufficient number of hogs to

keep them busy and were obliged to buy in the open market, but gradually, as the confidence in the system grew and the membership increased, the number of hogs bought from outsiders decreased. The largest packing house in Denmark affords a good instance of this. From 1890 to 1892 the average number of hogs annually supplied to this house by outsiders was slightly larger than the number supplied by the members, the figures having been about 12,000 in the former case and 11,000 in the latter. In 1896 the number supplied by members had risen to 43,471, while that from outsiders was 10,480. Since then the outside proportion has rapidly fallen away to almost nothing, the respective totals in 1902 (the latest year for which the figures are available) having been, from members, 66,506; from outsiders, 546.

The packing houses are centrally located and the remotest farms are usually not more than about 15 miles distant.

COMBINATION OF THE PACKING HOUSES.

The common interests of the packing houses were so numerous that in 1897 they united in forming an association and established an office at Copenhagen. Their object was to obtain favorable legislation, increase their exports, and improve the quality of their output. Each packing house sends three delegates to the general meeting, which is held annually, and takes up questions relating to the business and elects a directorate of five from the directors of the packing houses, each to serve two years. These in turn choose two packing-house managers for one year each. These seven elect their own chairman and manage the affairs of the association during the year. The expense of conducting this organization is divided among the packing houses and amounts to about 0.4 cent per hog killed. All the cooperative packing houses have joined this association.

The association has worked for cheaper and more rapid transportation of the products of the packing houses. It has likewise organized a mutual insurance of all of its bacon shipped to England, in this way equalizing the losses. The workmen in the packing houses insure in this association against accidents; each packing house for this purpose withholds a small percentage of the weekly pay and to this adds an equal sum. In order that no single house should alone bear the loss caused by a strike, all the packing houses have agreed to share such losses, and when practicable to furnish a sufficient number of men to take the places of the strikers. In several instances the organization has alone prevented the occurrence of a strike.

To show further how the Danish cooperative packing houses are conducted, translations are given of (1) the rules governing a typical cooperative packing house, and (2) those governing the combination or association of packing houses.

RULES OF THE COOPERATIVE PACKING HOUSE OF ESBJERG.

SEC. 1. The cooperative packing house of Esbjerg is established for the purpose of disposing of the hogs of the members in the best manner without counting on any profit for the factory. A member is anyone who binds himself to deliver to the factory all the hogs he can spare. A directorate of eighteen members controls the packing house. The members form five circuits, each represented by three directors, as follows:

Circuit 1 consists of the following parishes: Aslev, Bryndum, Esbjerg, Guldager, Hostrup, Jerne, West Nebel, Skads, Varde, and Varde (country).

[Then follow names of parishes constituting circuits 2, 3, 4, and 5.]

At the general meeting of the representatives of the circuit there shall be chosen each year a member of the directorate. Besides these five circuits, Lemvigegn, Thyegn, and Skjernegn are to form one circuit and choose a member every three years by the representatives of the circuit. Thus the directorate consists in all of eighteen members, one-third retiring in turn each year as heretofore.

Parishes having ten cooperative members choose one representative; parishes having fifty cooperative members choose two representatives, and then one representative for each additional fifty cooperative members. The cooperative members of the parish choose the representative by simple majority for one year at a time. Each member is obliged to serve, when elected, but can not hold more than one office at a time. (See, however, sec. 17.)

SEC. 2. The members of the cooperative packing house own the packing house in proportion to the value of the hogs they have delivered. In the course of the seven-year periods members of the cooperative packing house can not be exempted from their obligation to deliver hogs, unless they move from the parishes where members of the cooperative packing house reside. In case the property changes hands this must be reported to the directorate within two weeks, and the new owner may take the place of the former if he signs a printed declaration, of which the representatives must provide themselves with copies. If a member moves out of the parish or resigns from the packing house, the parish decides as a solidary body the extent to which he shall be liable. If a member desires to withdraw he must notify the directorate in writing three months before the end of 1895. If a member fails to notify, the directorate regards him as a member for the next seven years, and so on for each period of seven years thereafter.

SEC. 3. On delivery the members receive as prepayment four-fifths of the value of the hogs. As soon as possible the officers send a preliminary statement according to the slaughter weight and quality and pay the difference between the prepayment and the statement. The final settlement takes place on December 31 of each year, based on the difference between what has been received during the year for sale of bacon and wastes and what has been paid to the members according to the preliminary statements, less running expenses, payments to the reserve fund, interest, payments on debts; each member receiving pay in proportion to the number of hogs he has delivered during the year (boars and sows not included).

The members make good to the packing house any eventual deficit in proportion to the weight of the hogs they have delivered in the course of the year, either in cash or by allowing it in the price of the hogs to be delivered. The directorate has authority to decide in this matter.

SEC. 4. No member can sell slaughter hogs—not including boars, sows, and pigs weighing less than 100 pounds—elsewhere than to the packing house, excepting hogs sold to day laborers and artisan families, slaughtered for home

consumption. A member convicted of having violated these rules is bound to pay 50 kroner (\$13.40) for each hog that he has sold in this way. This fine may be reduced to 25 kroner in cases where it is settled peacefully or by arbitration.

A sow (in this sense) is one that has had at least one litter or is clearly with young. Hogs that, on account of defects, are unthrifty or that can not be taken to the packing house without risk or pain are exempt. Sick hogs can neither be delivered nor accepted at the packing house.

All matters having to do with receiving stations in the country are decided by the directorate and the local representatives.

SEC. 5. The books are made up December 31 of each year and the accounts are presented at the regular general meeting in the January quarter. Furthermore, the books are made up three times a year, namely, April 1, July 1, and October 1. This statement is to be shown to the directors immediately and sent to the representatives.

The directorate decides how much is to be added to the reserve fund, but without the consent of the general meeting it must not at any year exceed 2 per cent of the amount paid to the members at the close of the year as the final settlement for hogs delivered during the year.

The banking firms handling the money of the packing house allow interest on the reserve fund. The directors select this firm.

It is necessary to insure all the products of the packing house against fire, sea, and accidents, but this may be omitted by the consent of the directors.

SEC. 6. The general meeting is the supreme authority in all the affairs of the society, and decides by a simple majority. Its membership consists of the parish representatives mentioned in section 1, and these alone can vote at the general meeting. All cooperative members may, as a matter of course, attend the general meeting and take part in the proceedings, but they have no right to vote.

The regular annual general meeting is held in the January quarter of each year. The general meeting determines the place and the president announces the day of meeting in the local papers of the district two weeks in advance. It is necessary to send to the parish representatives the subjects for consideration two weeks in advance. Any member may bring up a subject for discussion at the general meeting if it is sent to the president before the 1st of January.

The president may call an extra general meeting, and is obliged to do so when more than one-half of the directors or not less than ten representatives request him in writing to do so, and inform him of the subject for consideration.

SEC. 7. The directors choose from their own number a president and a vice-president. The president calls the meeting whenever he or five of the directors deem it necessary.

The directors are to keep a record of the proceedings and decisions of the meetings of the directors; all the directors present sign the minutes each time. Furthermore, the directors keep a separate record of the transactions of the general meeting, to be read at the next general meeting.

The president of the directors may at any time, and is obliged at least once a week, to inspect the management of the packing house and enter its condition in a record intended for that purpose.

The general meeting fixes the salary of the president.

SEC. 8. No new loan can be made without the consent of the general meeting. The directorate may as security mortgage the property of the society if this is necessary.

The cooperative members guarantee the loan by parishes in a solidary way—"each for all and all for each"—in proportion to the number of hogs they have

promised to deliver; yet the directorate is at liberty to decide to what extent a town or farm is singly responsible.

SEC. 9. The directors choose a manager, a bookkeeper, and a treasurer. The general meeting fixes the pay of these officials on the recommendation of the directors. The directors and managers employ, on the advice of the local representatives, the help necessary to receive the hogs. The manager employs and dismisses other help and is responsible for the work of the packing house. The treasurer pays the manager, bookkeeper, and clerks by the month. Other employees are paid by the week and receipt by signing the pay roll.

The president of the directors and the manager must each furnish bonds of 10,000 kroner (\$2,680) and the treasurer of 4,000 kroner (\$1,072). Hog receivers must furnish as large bonds as the directors and the manager deem sufficient, and their work is decided by the directors and manager. The manager receives and classifies the hogs that come directly to the packing house and accounts daily for the same to the bookkeeper. In the ordinary course of business the manager and the president or some one selected by the directors are authorized to sign for the packing house.

The directors and the manager organize and control the retail store of packing-house products connected with the packing house.

SEC. 10. The general meeting elects two paid auditors, who are to be expert accountants. They are elected for two years and withdraw by turns. The general meeting decides their pay. The auditors audit the accounts of the year and may at any time examine the different cash accounts, the balance in cash, and methods of accounting, as well as examine the stock on hand, etc. The auditors are bound to audit the cash balance not less than once a month and the accounts once in every three months. One auditor may examine the cash balance.

SEC. 11. The original cost of construction is to be paid in twenty-one successive years, beginning with January 1, 1889, and when it is fully paid the packing house belongs, as stated in section 2, to all the cooperative members in proportion to the value of the hogs they have each delivered.

SEC. 12. The annual account, with the remarks of the auditors, is to be sent to all the representatives two weeks before the general meeting. The general meeting passes on this every year.

SEC. 13. Two-thirds of the parish representatives must be present and pass the resolutions with a two-thirds majority in order to make a change in the rules. In case a change can not be made because the general meeting has not a quorum a new general meeting is called in the same manner to meet in the same place, and in that case this meeting is considered without question as having a quorum and can make the change by a two-thirds vote.

SEC. 14. To decide whether the packing house shall close or be sold it is necessary that two-thirds of the representatives consent, but before the question is settled the cooperative members in the parishes shall vote on the matter. The votes are to be counted in the general meeting, and if there appears to be a two-thirds vote for closing or selling the question is settled.

SEC. 15. Cooperative members are entitled to receive at the nearest railway station a shipment of wastes from the packing house, freight prepaid, at the current price, when the order is not less than 100 pounds; the charges are paid on the demand of the railway company.

SEC. 16. In case of fire, blockade of harbors, prohibition against exports, or strikes the packing house is not bound to receive hogs.

SEC. 17. Differences between the packing house and cooperative members are as a rule settled by arbitration at the option of the directors. The arbitration

board consists of three members, of whom the president and vice-president are chosen at the annual general meeting for one year.

When disputes occur both sides choose one arbitrator and one substitute each. If either side fails, upon the written request of the other, to appoint an arbitrator within a week and to inform the other side thereof in writing, or if the chosen arbitrator refuses to serve, the other side may appoint both. Arbitrators selected in this way decide, together with the arbitrator selected by the general meeting, the point at issue.

The decision reached by the majority of the board of arbitration is final and must be accepted unhesitatingly by both parties. If the three arbitrators form separate opinions, the substitute of the chairman steps in.

The chairman keeps the minutes of the arbitration, decides the order of the proceedings and how the case is to be treated, makes copies, issues calls for the meetings, and fixes time and place of meeting. Any copy signed by the chairman is sufficient proof of its validity.

None of the arbitrators must be in the service of either party or be related by blood or marriage to one or more members of the directorate or to the other party nearer than the third degree. In case an arbitrator for this or other reasons can not act, the respective substitute takes his place.

RULES OF THE ASSOCIATED DANISH PACKING HOUSES.

SEC. 1. Three representatives are chosen for each packing house, and these constitute the general meeting.

SEC. 2. To conduct the affairs of the association they elect from the directors of the packing houses five representatives, who in turn choose two managers for one year. The directorate is elected for two years in such a way that two members withdraw at the end of the first and three at the end of the second year. (After the lapse of one year two members withdraw the first time by lots.)

The directors choose a chairman and fix the headquarters of the association.

SEC. 3. To protect the interests of the different sections of the country in fixing quotations the general meeting may appoint committees chosen by each section of the country.

SEC. 4. The general meeting, being the supreme authority in the association, meets every year in the second half of the month of March. At this meeting the accounts closed in the month of January are presented for ratification, directors are elected, and a meeting place for the next general meeting is decided upon.

SEC. 5. Important matters for the consideration of the general meeting must be in the hands of the president by the 1st of March.

SEC. 6. Directors of packing houses may be present at the general meeting, but can vote only when they are representatives.

SEC. 7. An extra meeting may occur whenever the directors deem it necessary or when the representatives of not less than three packing houses so request.

SEC. 8. The expenses of the association are divided among the packing houses in proportion to the number of hogs slaughtered, and are collected annually.

SEC. 9. Application for admission may be made to the president of the association. Withdrawal may be made only in writing after six months' notice.

SEC. 10. The president calls a meeting of the directors as often as he finds it necessary or when not less than three members of the directorate so desire.

SEC. 11. Changes in these rules may be adopted by a two-thirds vote.

Adopted at the meeting at Aarhus, July 8, 1897.

INSTRUCTIONS FOR PREVENTING TUBERCULOSIS IN HOGS.

The general meeting of the cooperative packing houses requested the general office to prepare and forward to the different packing houses brief directions as to how to avoid tuberculosis in hogs. The general office accordingly prepared the following directions,^a which a packing house may include in its statements to members whenever it has been obliged to make a deduction by reason of tuberculosis.

On February 18, 1905, the agricultural ministry announced that bacon exported to England must not show traces of tuberculosis.

By reason of the above order the packing house has been obliged to deduct from your account — per cent of the value of — rejected hogs.

To avoid similar losses in the future the following directions should be observed:

1. Hogs must never get milk or creamery wastes that have not been heated to 80° C. (176° F.).
 2. They must never get unboiled colostrum, household milk, or milk from cows with diseased udders.
 3. Hogs must not enter the cow stable nor root in the cow manure.
 4. They must never eat the carrion of animals or poultry.
 5. They must never obtain butcher's waste, either of cattle, hogs, calves, or poultry. All feed of this nature must be boiled or buried.
 6. Never employ tuberculous animals for breeding purposes. Be cautious, therefore, in buying breeding animals, especially at auctions, where no guaranty or pedigree is given.
 7. Never buy sucking pigs fattened with raw cow's milk.
 8. Clean and disinfect thoroughly the stable every time a set of hogs leaves it after being fattened.
 9. Disinfect the hog stable at least twice a year.
 10. Provide good ventilation and abundant light for the stable and good runs for sows, sucking pigs, and shoats.
- Observe these rules and tuberculosis will disappear.

THE EXPORT BACON TRADE WITH ENGLAND.

Prior to 1887 the bulk of the exports of hogs and hog products from Denmark had gone to the neighboring country, Germany. In the year named, however, the Germans closed their markets to Danish hog products, and it became necessary to find a new outlet. Thus it came about that the Danes turned their attention to England and started a trade with that country, which has since become so large and profitable to them. The transition from the German to the English market was accomplished without any serious difficulty. Fortunately, when the German prohibition came at the end of November, 1887, the Danes had disposed of more hogs than usual at that time of the year, and therefore had time to look around without incurring much loss. At this juncture all foreign markets except those of France and England were closed against Danish bacon, and as

France had a surplus of hogs this year England alone could be considered. In the hope of developing the exports to England the Government subsidized a line of boats to run regularly three times a week between Esbjerg and London. For trade with England, Esbjerg, on the west coast, seemed to be most favorably located, and it has since monopolized most of the bacon exports.

WEEKLY SLAUGHTER REPORTS FROM PACKING HOUSES.

For some time after the establishment of the English trade the market was unsteady, chiefly from lack of accurate knowledge of the supply. Instead of combining where their interests coincided, the Danish export packers were suspicious of each other and refused at first to give out any information as to the number of hogs slaughtered weekly in their packing houses. They feared that this information might be used for private ends. In consequence uncertain rumors often disturbed the English market. Speculators took advantage of the situation and gave out exaggerated or minimized statements concerning the shipments that were on the way from Denmark. London papers complained of the uncertainty of the Danish supply and called attention to the fact that the price had in one week fallen 6 shillings (\$1.46) and again in two weeks gone up 8 shillings (\$1.95) per hundredweight. These sudden and violent changes demoralized the market and injured the trade. Men who had the real interests of the industry at heart tried to create a steady market. The Danish state adviser in England suggested that the Danish packers, like those in Ireland, should report weekly the number of hogs killed. The Danish Agricultural Society took up the matter, and after some hesitation most of the packing houses agreed to this arrangement, which went into effect at the end of 1891. Since that date all the packing houses have consented to give out this information. Late Saturday afternoon each packing house sends to the central office a confidential statement of the number of hogs it has killed during the week. A trusted man compiles the information and telegraphs it Sunday afternoon to England and to the Danish packing houses. On Monday they receive a statement of the number of hogs killed in Ireland, together with the prices in the London market. This arrangement has given good results and has greatly tended to steady the market.

IMPROVING MARKET CONDITIONS IN LONDON.

The sale of bacon in London was for a long time in the hands of a few firms that acted as agents and charged a commission of 3 per cent. As the same agents controlled the Irish packing houses, the Danes felt at times that the Irish were favored. Other conditions

likewise hindered the development of the trade. For years there had been an understanding between the agents and the wholesale dealers in London. The agents agreed not to handle the bacon for less than a 3 per cent commission and to sell only to the wholesale dealers and to a small number of retailers entered on an old list that was seldom revised. The wholesale dealers promised to buy only from the agents and not from the packers. Thus the packers had to sell to the agents, and the retailers, with the exception of those on the list, had to buy from the wholesale dealers, even though their business had meanwhile grown large enough to entitle them to buy directly from the agents. This artificial arrangement was profitable to the middlemen, but directly antagonistic to the Danish principle of working in the interests of the producers and the consumers. In the eyes of the Danes the London agents represented an antiquated system and served only to increase the price of the bacon. The wholesalers, on the other hand, formed a necessary link and kept up large and expensive establishments, stores, smokehouses, ovens, service, etc. The Danish trade now represented 10,000 packages of bacon a week and was of sufficient importance to have a separate agency.

For the purpose of counteracting these difficulties and obtaining an independent position on the market, some of the largest and oldest Danish packing houses established in May, 1902, a stock company known as the "Danish Bacon Agency, Limited." In the first year the agency handled about 2,000 packages of bacon a week. Since then more packing houses have joined the company and the sales have increased. After fighting the agents about a year and a half the packers came off victorious. The commission for handling bacon has been reduced to $1\frac{1}{2}$ per cent and the market quotations have become stable.

DANISH IMPORTS AND EXPORTS OF BACON AND HAMS.

The table which follows shows the foreign trade of Denmark in bacon and hams for the past twenty-one years. The statement is compiled from Danish official reports, and both the imports and exports as given are classed as "Special" trade—that is, the imports were only such as were brought into the country for consumption, while the exports were exclusively Danish product—thus eliminating the transit trade. It is well to state here that, contrary to the usage in this country, the Danes ship the sides whole, so that bacon and hams are always combined.

As might be expected in a country which produces so much bacon, the imports are of very small importance compared with the exports. They probably consist mostly of such trade as may occur near the border with contiguous countries. It will be seen that the exports of

Danish bacon have steadily increased with the development of the industry down to the present time. Before the methods of curing were as well understood as they are now, the exports of live hogs far exceeded those of bacon and hams. The turning point came in 1887. After this year the exports of bacon increased rapidly, and those of hogs decreased until in 1896 the shipments of live hogs practically ceased entirely, and they have not since revived. The bacon trade at first was distributed among several countries, but it speedily gravitated toward England. In 1885 the latter country received two-thirds of the total, and after 1888 nearly all the bacon and hams from Denmark were sold in English markets.

Recognizing the importance of the English trade, the Danish Government took steps to foster it. The Royal Danish Agricultural Society took the matter in hand and sent trial shipments to England, also experts to report on the markets, and in the spring of 1888, as previously stated, the Government subsidized a line of boats to run regularly three times a week between Esbjerg and London for the purpose of carrying the bacon. Thus the Danes set about systematically to win and to hold the London market, and the exports have risen accordingly. In the twenty years between 1886 and 1905 the average annual increase has been over 7,000,000 pounds a year.

Danish imports and exports of bacon and hams, 1885 to 1905.

Year.	Imports (for consumption).		Exports (domestic).		Average price per pound of exports.
	Quantity.	Value.	Quantity.	Value.	
	Pounds.	Dollars.	Pounds.	Dollars.	Cents.
1885.....	4,281,860		30,233,107		
1886.....	2,757,256		86,611,497		
1887.....	1,484,192		50,693,975		
1888.....	207,114		86,234,239		
1889.....	69,145		69,354,528		
1890.....	196,941		60,282,048		
1891.....	329,022		71,365,161		
1892.....	1,203,189		78,206,901		
1893.....	383,778		99,423,810		
1894.....	978,245		92,963,583		
1895.....	854,860		122,925,144		
1896.....	834,351		156,915,916		
1897.....	2,720,912	200,696	132,243,566	14,367,821	10.86
1898.....	3,497,582	247,563	129,805,160	13,033,049	10.04
1899.....	2,721,981	170,662	158,833,832	14,384,900	9.06
1900.....	2,603,638	195,211	139,698,192	15,794,848	11.31
1901.....	3,595,913	358,385	132,828,850	16,229,276	12.22
1902.....	2,701,627	281,668	157,858,285	19,066,944	12.07
1903.....	2,515,449	252,724	177,934,106	20,038,360	11.26
1904.....	1,897,757	146,060	204,849,121	21,507,804	10.53
1905.....	3,203,540	278,184	175,956,995	21,444,020	12.19

SUGGESTIONS FOR HORSE AND MULE RAISING IN THE SOUTH.^a

By GEORGE M. ROMMEL, B. S. A.,
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INTRODUCTORY.

With the development of agriculture in the South and the discussion of the best methods to follow and the best policies to adopt few subjects have received more attention from public speakers and writers than the production in that section of the animals needed for work purposes and meat production. The idea is not only that the South should supply its own demand for these animals, but that southern farmers should feed as far as possible the enormous amount of cotton-seed meal and cake which is now shipped out, and thus replace commercial fertilizers to a considerable extent and keep up fertility with barnyard manure. Southern farm methods now in vogue have been criticised by outsiders, but none have been more severe than the leaders in agricultural progress in the South who are southern bred and born.

It certainly seems anomalous to contemplate a vast section of our country spending millions annually for horses and mules, for beef and pork, and for commercial fertilizers, and selling hundreds of millions of dollars' worth of fertility as cotton-seed meal and cake, when we realize that the condition of soil and climate generally throughout the South are excellent for animal production. This condition is still more surprising when we know that, properly fed, cotton-seed meal is probably the most valuable protein-bearing feed the country produces, and that its fertilizing value after having gone through an animal's body is almost as great as its feed value. It is also more than passing strange that a southern farmer will buy hay shipped from the West at from \$15 to \$23 per ton when his own land will often yield more hay per acre than the land where the western hay was produced and of as good a quality.

^a This article is based on an address delivered before the South Carolina Dairy and Live Stock Association February 8, 1907. Although the address was prepared primarily for a South Carolina audience, the statements made therein apply equally well in other Southern States, especially those east of the Mississippi River.

INADEQUACY OF LOCAL SUPPLY OF HORSES AND MULES.

According to figures of the Bureau of Statistics of the Department of Agriculture there were 83,026 horses in South Carolina on January 1, 1907. These horses had a total farm valuation of \$10,437,182, an average of \$126 a head. The same authority estimates the number of mules in the State on the same date at 134,690, with a total farm value of \$20,598,121 and an average of \$153 a head.

The average life of a horse in South Carolina from the time he is mature may be estimated at eight years and that of a mule at ten years. The stock of horses and mules must therefore be replaced once in each eight or ten years, respectively; or, to express it differently, 10,000 horses and 13,000 mules must be raised or brought into the State annually. If all were bred in South Carolina that would require at least 135 stallions and 12,500 mares for horse breeding, estimating a stallion to get 75 colts annually and 75 per cent of the mares to breed each year. For breeding mules the number of jacks required would be at least 240 and the number of mares 26,000, estimating a jack to get 50 mules a year and about 50 per cent of the mares bred to jacks to breed. This would mean a total of at least 38,000 brood mares. To keep up this supply of breeding mares probably 10,000 more should be added to the total. In other words, at least one-half the total number of horses now in the State should be mares used in breeding both horses and mules.

Furthermore, these estimates do not take into account the number of foals and horses from one to four years old necessary to keep up this number, which would be nearly as many more. Therefore, if South Carolina produced her own horses and mules, nearly as many horses and mares as the State now has altogether would have to be in the breeding ranks. In other words, the State has only half as many horses as are actually needed. If we had no other proof, this alone would show that the State goes elsewhere for its horses and mules.

REASONS FOR RAISING HORSES AND MULES AT HOME.

In the opinion of the writer, there are three reasons why South Carolina farmers should raise their own horses and mules. The first one is to keep within the State the great sum which is paid annually for stock shipped in from the North and West. From the estimates given and from the best information at hand, which is largely in the nature of estimates of southern men of experience and authority, it would appear that probably only about 2,000 of the horses and 1,000 of the mules used annually are raised in the State. Estimating the cost of the horses delivered to the South Carolina farmer at \$125 each and of mules at \$175 each, the amount of money sent out of the State

annually is \$1,000,000 for horses and \$1,925,000 for mules—\$3,000,000, in round numbers, which could be retained in the State to good advantage.

It may be said that if the State produced its own horses and mules the general market of the country might suffer, and local horse and mule breeders might not be able to raise them at a profit. It is doubtful if this is true, in view of the tremendous activity of the horse and mule markets. The year 1906 was one of unparalleled prosperity for horse and mule breeders. Prices bounded skyward, and for all classes there was a demand greater than the market could supply. This demand shows every indication of being maintained until the supply can meet it, and as long as conditions in business are good there is little, if any, reason to fear an oversupply. The rise in prices of horses in the United States has been such that the export trade has practically ceased except for the best grades of light horses. The European market can not pay the American prices. Should domestic prices decline to the European standard, the export trade would begin again, and this would prevent them from falling below a profitable level.

The second reason is that by producing its own horses and mules the South has stock already adapted to its use. No time is lost in getting an animal to do his best under southern conditions. Furthermore, they would be produced at cost, without having to include in the expense bill a profit to any other producer or middleman. Not only that, but after a horse or mule is 2 years old he will earn his way, and a moderate amount of work is good for him. In this way the animal has been raised to 5 years of age at a minimum cost. Not only is all this a great advantage, but the breeding of the stock is known, or if not it can readily be ascertained. This is of immense importance. If a farmer owns a good horse or mule, naturally he wants another like him, and if the sire is within reach it is an easy matter to breed mares to him with a reasonable expectation that the sire will duplicate his previous performances.

Let us digress for a moment to point out more in detail the value of knowing something of an animal's ancestry before buying. The laws of heredity are powerful, and they work not through the parents alone, but through grandparents, great-grandparents, and even more remote ancestors. If a line of breeding is proposed which is composed entirely of animals of merit, the mating is almost sure to result satisfactorily; but if there is a stain in it, if some animal was below standard, its faults will crop out somewhere in its descendants. That is the reason why pure breeding is surer than haphazard breeding, and why it is undesirable to breed to "scrubs." It is for this reason that the persistent use of purebred sires of the same breed is sure to show great improvement over the original foundation stock. If

for no other reason, then, southern farmers should breed their own animals so that they can know their breeding and use this knowledge for future benefit.

The third reason why the South Carolina farmers should breed horses and mules is that the State has excellent possibilities for stock raising, and that when the supply is increased beyond local needs the demands of outside markets can be filled. The greatest horse-raising State in the country is Iowa, and the greatest horse market for the number handled is Chicago. However, it is estimated that at least half of these horses are sent from Chicago to other points, some for final sale, others for further fitting for market. The highest class of horses will generally be found in the East, in New York and Boston, and the highest prices for good horses are to be had in these cities. Now, if an Iowa farmer sells a horse to a Chicago buyer, and the horse eventually goes to New York, that buyer's profit and the other expenses incident to sale must be included in the price obtained in New York. Des Moines, Iowa, and Columbia, S. C., are quite near the geographical centers of their respective States. Columbia is over 400 miles nearer New York and Boston than is Des Moines. Columbia is just that much nearer the country's best horse market, and there are three large cities and three great ports on the Atlantic seaboard between Columbia and New York, all of them on a direct line from Columbia.

So far as the markets are concerned, the South Carolina farmer has as good advantages as the Iowa farmer. These advantages are not developed, it is true, but the conditions are full of latent possibilities. If good horses are bred in the South, the buyers will soon find it out and there need be no fear that good prices will not be obtained for good products.

POSSIBILITIES OF SOUTHERN MULE MARKETS.

Let us now consider the possibilities of the mule market. Although many of the best draft mules are sold to the cities of the North at top prices and many are used on the farms of the Central West, the backbone of the mule industry is the southern demand. These mules are bred mainly in the States within touch of Kansas City and St. Louis, and these markets handle most of the mules of the country. St. Louis, Memphis, New Orleans, and Atlanta are the great distributing points. South Carolina is probably too far from Kansas City or St. Louis for her mules to sell on those markets in competition with those raised in Missouri, Illinois, and Kentucky, and these States are also much nearer the Memphis market. Further, St. Louis is 40 miles nearer New Orleans than Columbia, and on a direct line; but look at Atlanta. Columbia is only 253 miles from Atlanta, via Augusta; yet Memphis

is 419 miles from Atlanta, St. Louis is 733 miles away, and Kansas City is 903 miles away. Atlanta is coming to be one of the great mule-distributing points of the South, and is now the greatest one in the Southeast. No doubt South Carolina farmers get many of their mules from Atlanta, which were first sold on markets two or three times as far from Atlanta as Columbia. The reason for this is surely not that South Carolina can not produce good mules, because there were on exhibition at the 1906 meeting of the South Carolina Dairy and Live Stock Association native mules which were as good as any market requires. With the development of Atlanta as a mule market, the reason that more mules are not bred in South Carolina can not be that there is not a convenient market. A golden opportunity exists here for anyone brave enough to break away from custom and act as a pioneer in mule raising. South Carolina farmers need thousands of mules of a good grade, and at their very door is a market which is in touch with the demand of half a dozen States. What more could be desired?

METHODS OF BREEDING AND MANAGEMENT.

The methods of breeding and management that should be used to produce horses and mules in South Carolina will next be considered. It is a comparatively easy matter to discuss this phase of the subject from the standpoint of central western conditions, but the writer must confess that he approaches it with considerable trepidation when applied to southern conditions. So far as soil, climate, pasture, and forage are concerned, the conditions in the South are very nearly ideal, but there are other circumstances to be considered, chief of which are the use of negro labor and the general inferiority of the stock which must be used as the foundation on which to build. As to the negroes, no suggestions will be advanced except that many horsemen prefer them for hostlers and grooms. Throughout Kentucky the negro seems to be the favorite stable hand in many of the best breeding establishments, and it is well known that Mr. Ed. Geers, the famous trotting horsemen, will not have a white man in his stables if he can help it. These facts seem to show that the negro has possibilities as a horse handler.

NECESSITY FOR THE IMPROVEMENT OF NATIVE STOCK.

The inferiority of the native horse stock is mentioned not to find fault unnecessarily, but to get a point from which to approach the subject. We might as well be frank and recognize that a candid acknowledgment of defects in the animals under consideration will better enable us to reach a logical and definite conclusion. The class of horses which supply the southern markets is not a desirable one. Consult the market reports for St. Louis, Kansas City, Omaha, and

Chicago, and it will be found that the classes known as "southern horses," "southern chunks," etc., bring the lowest prices of any. They are variable in type, ranging from very inferior light chunks to a pretty fair type of drivers. As a general rule, they are horses which the Central West can well afford to sell at any price and the South can ill afford to buy, no matter how cheap they may be. This is said solely from the breeder's standpoint. They may be the best farm horses for southern conditions, and on that point the southern farmer's opinion is more valuable than that of the writer, but the writer can not resist the temptation to say that it is doubtful if they are more valuable than their market price would indicate. Two things are certain—most of the horses which the South has are obtained from the North, and the quality of these horses is generally the poorest of any sold on northern markets. It is not, therefore, unreasonable to conclude that, judged solely as horseflesh, the southern horse is not a very superior animal.

Whatever the value of the native southern stock it is there, and the mares must be used as the foundation for any improvement which may be made. Improvement should be begun gradually, without any expectation of jumping from mediocrity to the highest excellence at one bound, and it should begin with the idea of improving, first, the general average of the farm horse of the South.

The first step is the elimination of unsoundness, which should be done as rapidly as possible. In selecting mares for breeding only those should be chosen which are sound in wind and free from ring-bones, sidebones, curbs, and spavins. The tendency for unsoundness to appear is hereditary, and the presence of unsoundness makes a horse practically unsalable.

For most sections of the South the next step should be the increase of size, and this should be done somewhat gradually. The increase in the size of farm horses is of the greatest importance, especially where heavy clay soils are common. Two 1,200-pound horses will probably do more work and eat less than 3 weighing 800 pounds each, and larger ones probably in similar proportion.

Next, conformation should be improved. Conformation is important not only because it has a great effect on the selling price, but because a horse with good conformation will do more work and last longer than one with poor conformation. The points especially to be sought are as follows: Wide, open nostrils; medium-sized, clean-cut muzzle; clean-cut, open jaws; clean-cut head; straight face; wide forehead; large, clear, intelligent eyes; medium-sized, smartly carried ears, set close together; clean-cut throatlatch; clean-cut, well-muscled, long neck, smoothly joined to the shoulders; and sharp, smooth withers. The shoulders should be sloping, and should extend

well into the back; the arm should be well muscled and well thrown back. The forearm should be wide and muscular, the knees wide and strong and strongly supported. The cannon should be flat and well developed, so that there is no falling away below the knee. The fetlocks should be wide and straight, the pastern of medium length, strong, and inclined at an angle of about 45 degrees. The feet should be of good size, with large hoof heads, dense bone, well-developed frogs, and wide heels of good height. The back should be straight, broad, and well muscled, and the ribs well sprung. The loins should be straight, broad, well muscled, and closely coupled to the hind quarters; the croup wide and straight; the quarters fully developed; and the tail set high and smartly carried. The flanks should be full. The hocks should be clean cut, wide, strong, and straight, and the supporting cannons broad and flat. Further description of the hind limb practically corresponds to that of the fore limb.

The necessity of these points from the standpoint of durability is obvious on a moment's reflection. A wide, open nostril generally indicates good lung capacity and therefore good constitution. A wide forehead usually indicates brain capacity; a straight face, docility; a full, clear eye, intelligence; an erectly carried ear, alertness. Roman noses frequently indicate strongheadedness and dished faces viciousness. A horse with a narrow nostril, Roman nose, small "pig" eye, narrow forehead, and badly placed lop ears is usually one to be suspected of being capable of all kinds of equine villainy. A thick throatlatch and short, thick neck indicate a horse which will probably be thick in the wind. Meaty withers and shoulders are seldom found with good action. A straight shoulder and pastern shows a limb predisposed to ringbones, sidebones, and other diseases, and a horse with such conformation will not wear well. Good feet are necessary, as shown by the old adage, "No foot, no horse." The development of the "middle piece"—the body—is necessary for many obvious reasons. A horse with a narrow, shallow body, low back, and weak coupling is not only a weak horse with little constitution, but a poor keeper; a fully developed back, well-sprung ribs, deep body, and closely coupled loins usually indicate a strong one. The development of the floating ribs is important, especially in a brood mare, to allow full room for the development of the digestive and reproductive organs. A full hind flank is important for the reason that a "wasp-waisted" horse is usually a poor feeder and lacks stamina.

The development of the hind quarters is necessary, because the greatest amount of the animal's propelling power is developed there. Not only is muscular development necessary, but the hind legs must be well shaped to endure the great strain that is exerted when pulling

a load. The hocks and the legs from these joints to the pasterns should be parallel and set rather close together. Viewing the leg from the side, the back line from the point of the hock to the ground should be perpendicular. The angles of the bones of the lower leg should form an angle at the hock with the cannon of about 60 degrees. If this angle is greater we have what is known as a straight leg, and consequently a hock predisposed to curbs. If the angle is much less a "sickle hock" results. Deflection of the hocks inward causes what are known as "cow hocks." Bad conformation in the hock joint and light development of the joint predispose to spavin, one of the most serious forms of unsoundness.

This, in a general way, covers the points to be looked for in conformation and the reasons for them. Next, we should look for quality. This is shown in the cleanness of the head, neck, and bones of the leg, by the clean-cut appearance of the tendons, the softness and fineness of the hair, and the texture of the skin. Quality is an index of the breeding of a horse and of his stamina and durability.

Next, action should be looked for. This in a farm horse is most important at the walk, which should be regular, straight, free, and, above all, rapid. A fast walker is a far more valuable worker than a slow one, and will turn many more furrows in a day. Action at the trot should be quick and free, straight and true. High action is not necessary in a farm horse, but the knees and hocks should be flexed well with snap and precision.

Finally, in breeding stock the farmer should look for uniformity. His mares should be as nearly alike as possible, and should be so bred as to produce uniform colts.

This will give an idea of the type of farm horse which will readily do work enough to pay for his keep. Any specific mention of the proper size for such horses has purposely been omitted, for the reason that this matter is so important that it can well be taken up again in addition to what has already been said. It is useless to expect a farm mare to produce a good-sized mule or work horse if she herself is undersized. If the South is to produce good salable mules the size of the farm mares must be increased. If it is ever to sell horses at a profit on the New York or Boston markets, the same thing must be done. In the writer's opinion the standard weight of a farm mare should be 1,200 pounds. A mare having the description given, with this weight, would produce a good mule when bred to a good-sized jack, and when bred to a suitable stallion would produce a good work horse for the farm. This statement of standard weight applies to South Carolina under present conditions, and does not apply to conditions which might obtain in other sections of the country, and might not hold even in South Carolina after several generations of systematic breeding up, as will be shown later on.

SELECTING A STALLION.

The selection of stallions to be used in improving the native stock is the next consideration. In breeding animals on the farm one idea should be continually in the farmer's mind—breed true and do not cross. Nothing will produce mongrels more quickly than to breed mares to a stallion of one breed, their progeny to another, theirs to another, and so on. Breeding the same mares to different stallions each year will result in the same thing in the long run. To make success reasonably sure the farmer should determine for himself which breed of horses suits him best and which type in the breed. He should have only his own necessities and market demands in mind. After making such a decision he should select a good, sound, purebred stallion and breed to him, selecting others as may be needed to prevent inbreeding.

HOW TO BUY THE STALLION.

After the decision has been made to improve the native stock by breeding to purebred stallions, steps should be taken to get such a horse if one is not in the vicinity. As a general rule it is probable that purebred stallions are not found in very many parts of the South, and few farmers have enough mares to warrant the purchase of a horse outright. Where such is the case, enough men in a neighborhood to represent the ownership of, say, 75 or 80 mares might band together and organize a company for the purchase of a horse, each man paying into the treasury of the company a sum proportioned to the number of mares he wishes to breed. Then let this company decide on the breed to use and send a competent representative to visit breeding farms and select a horse. The same plan may be used for the purchase of a jack. By purchasing in this way animals can be obtained at the lowest possible figures and the company has the advantage of dealing with the breeders direct rather than through their agents. Furthermore, if the representative of the company is qualified to judge, the company is likely to get good value.

The company system of selling stallions used by many importers and breeders is applied in the opposite manner. A representative of a stallion owner visits a community and himself proceeds to organize a company. He frequently associates some prominent man with him, giving him a share of stock for his influence. When sufficient men come in to cover the selling price of the stallion at the fixed price for shares, each member gives his note for the amount represented by his share, the agent discounts these notes, and the horse is sold. It is an unfortunate thing that this company method of selling stallions is used. Many horsemen condemn it strongly, even though they may use it. Its existence is condoned on the plea that if it were

not used the horses would not be sold; that the horse must be taken to the buyer, because the buyer will not go to the horse. That may have been true in the Central West several years ago, and it may be true in some parts of the South to-day, but in this day of tremendous prices for horses of all kinds it seems strange that a really good horse can not be sold on its merits.

The decline of the company system of selling in the corn belt is being followed by the adoption of the public sale by some breeders, and the firms that use the company system most extensively are carrying it into the South and far West, where less experience has been had with it. There is little doubt that the people of these sections, too, will soon find out the faults of the system, and we can look forward to the time when it shall have passed from us forever. The objections to the system are its expensiveness and general unreliability. To send an agent into the field for several weeks to sell one horse (and often the horse is with him, and a groom also), to pay this agent's commission and the discount on the notes, piles up a tremendous expense bill, which must be added to the cost of the horse and paid for by the purchasers. Stallion owners estimate that it costs on an average about \$1,000 to sell a stallion by the company system. A home-organized company could send a man to Europe for a horse at a smaller expense than that.

The unreliability of the system rests on the fact that, under the law, firms are liable for the acts of their agents only when agents act within the limits of their authority. If a firm wishes to do so, when a purchasing company finds an agent's promises of no value, it can retire behind the excuse that the agent exceeded his authority. However, there are, no doubt, more honest agents than dishonest ones, just as there are more honest stallion owners than dishonest ones.

The element of unreliability is of course not always present in the sale of a horse by the company system, for the representations of an honest agent of an honest firm can be depended on to the letter. But no firm can sell a horse in this way without great cost to the purchasers, in many cases more than the horse is really worth and in most cases more than the shareholders can ever hope to get out of their investment. The system has one great merit, namely, that it is taking many good horses into sections of the country where they are sorely needed, and probably the value of such horses to a community will be equal in the long run to the price paid for them, although this may not show in the books of the companies which purchase them.

THE BREED OF THE STALLION.

Beginners will find themselves confronted at once by the question whether to choose a horse of a light breed or of a heavy breed. By

a light breed is meant one of the carriage, roadster, or saddle breeds, such as the Standardbred, Hackney, French Coacher, Saddle Horse, or Thoroughbred. By a heavy breed is meant one of the draft breeds, such as the Percheron, Belgian, Clydesdale, Shire, etc. By selecting a horse of one of the light breeds the beginner starts on the road of producing first what our markets call general-purpose horses, and eventually horses of a better class—carriage horses, drivers, and saddlers. If a heavy horse is selected, the first cross will probably be a general-purpose horse also, but with less quality than when the light breeds are used. Eventually, however, this route leads to the production of heavy horses—the expressers and drafters of the market. The possibilities of these two methods are merely suggested without an attempt to advise specifically which one to follow.

The most common light breeds which may be used for the improvement of the native stock are the Standardbred, the Morgan, the Saddle Horse, the Hackney, the French Coacher, the German Coacher, and the Thoroughbred. The first three have one great advantage over all the others in that they are distinctly American products, and the Standardbred is most important of all, perhaps, because it is found practically wherever an American is found. The Standardbred is the national horse of America. He possesses more endurance and stamina than any breed of foreign origin except the Thoroughbred. Any improvement of the general run of light horses in America must be based on the Standardbred. Closely allied to the Standardbred are the Morgans and the Saddle Horse. The Morgans are small in number, but very prepotent. The true Morgan is a horse of excellent conformation and great powers of endurance. The Saddle Horse is the most beautiful and exquisite type of horse the world knows. No other breed possesses such beautiful finish, quality, and imposing appearance. The breed is also very prepotent.

As to the faults of these breeds—the great fault of the Standardbred is that it has been bred too much for speed, and in many cases utterly regardless of anything else. Unsound, ungainly stallions have commanded high service fees simply because they could trot fast and could reproduce this characteristic. As a natural result there is little trueness to type among Standardbreds. The Morgans may be criticised on account of lack of size and the presence of coarseness in some specimens, and the Saddle Horses because they sometimes carry finish and quality to an extreme at the expense of substance. The American Thoroughbred has been bred long enough to be regarded almost as a native. The blood of the Thoroughbred has been used in the improvement of the light stock of nearly every country. It is the purest breed known, possesses great endurance, stamina, and quality. The offspring of Thoroughbred stallions on native mares are likely to have an abundance of quality, but may be hotheaded.

Some Thoroughbreds are refined to the point of delicacy and lack size, and in such case should not be used.

The so-called coach breeds of foreign origin—the Hackney and the French and German Coachers—generally excel the Standardbred horse in conformation and action, but they do not breed true to type, as a rule, as do the Saddle Horses and the Morgans. The Hackneys are least to be criticised in this respect. Taken as a whole, all three breeds are what horsemen call “soft” and lack endurance.

The use of any of the native or foreign light breeds mentioned would probably result in an improvement over the native stock, showing considerable increase in size. For more immediate increase in size and much greater size after several generations of systematic breeding, stallions of the draft breeds should be used. The most common ones in the country are the Percherons, Clydesdales, Shires, and Belgians. The French Draft horses are also quite common, but differ little from the Percherons.

Percheron and French Draft horses are most common in the country and have been here longest. They are also the most popular draft breeds among farmers. Their particular points of value are their activity, strength, compactness, clean legs, and good feet. They have no especially weak points, but sometimes are light in bone. The Clydesdales, the famous draft breed of Scotland, are most popular in Canada and in the Northwest, although they can be found in nearly all parts of the country. They have remarkable action, are very well bred, handsome, and attain great weight. The grades of Clydesdale stallions from native mares do not appear to be so good as Percheron grades, sometimes being very light in the body and bone. The feather on the legs of Clydesdales is also an objection in the minds of some. Shires bear the same relation to English farming that Clydesdales do to that of Scotland. They are heavier bodied than the Clydesdales, have more bone, less quality, and more feather. The Belgians are probably the largest of the draft breeds. Their grades have not yet figured very prominently on the market, as the breed has been introduced only a few years. They have massive bodies, but tend to have rather short necks, coarse legs, and poor feet. It is fair to say that the breed has shown much improvement in America during the last two years, especially in the quality of the legs and feet.

It is important to urge the beginner again not to mix types and breeds. When a line of breeding is selected let him stick to it. If a mare is bred to a Percheron this year, follow it next year with the same mating and breed her fillies to Percherons and their fillies to Percherons. In time a system of breeding like this will give a stock of horses which are practically purebred, which have cost little if anything more than if a consistent plan had not been followed and which can be sold for prices far in excess of the offspring of nonde-

scripts. Furthermore, the stallions used should be registered in an American studbook certified by the Secretary of Agriculture at Washington. There is inserted at the end of this article a list of the studbooks of the country which were certified on January 1, 1907, with the names of their secretaries. By consulting this list the reader can determine whether the pedigree of a stallion is backed by the certificate of the secretary of a reliable studbook.

BREEDING MULES.

In breeding mules, the first point is to see that the mule's sire is a large jack, recorded in the American Jack Stock Studbook. He should stand 15.2 hands, or even 16 hands high, and should weigh up to 1,100 or 1,200 pounds. He should have a large, strong body and heavy bone. Weight and bone are cardinal points in a jack.

If mares sired by light stallions—Standardbreds, Coachers, etc.—are bred to such a jack, mules of good quality and fair weight may be expected. If the mares are by good Standardbred, Saddle, or Thoroughbred stallions, the mules will be very active and will possess much quality and finish. If these mares have good weight, say 1,100 or 1,200 pounds, this mating will produce the finest sugar mules; if somewhat smaller, good cotton mules will result. If draft-bred mares are used, the mules will of course be heavier. Such mules are the draft mules of the market and are in strong demand for city use. They have more weight than sugar mules, but not quite so much quality.

For small, indifferent 800-pound mares without breeding, nothing better can be expected than the production of inferior cotton mules, or pit and pack mules. It is useless to try to breed good mules from poor mares, and this is one reason why so much attention has been given to the discussion of the importance of horse breeding in the South. There will probably always be more demand in the South for mules than for work horses which can be supplied by locally raised animals, but it is necessary first to have a supply of good, useful farm brood mares. It is doubtful if any jack is good enough to sire a good mule from a small, coarse, plump mare.

GOOD FEEDING ESSENTIAL.

In conclusion, let it be said most emphatically that it is a waste of time and money to try to breed horses, mules, or any other kind of live stock without feed. It is all right to let animals rustle and find their feed, but they must find something worth rustling for when they do rustle, or the rustling will do far more harm than good. Exercise is splendid for the development of bone, muscle, and constitution, but it must be supplemented with plenty to eat. A farm

animal (horses and mules are no exception) makes its greatest growth when it is young, and it makes it at the least cost. It is a straight business proposition to feed young animals well, and it even pays to begin on the mother before the youngsters come into the world. Let the colts learn to eat a little grain before they are weaned, and keep this up when pasturage is poor. Let them run in the fields through the winter—the exercise is good for them—and bring them up at night and give them a feed. Do not think that because a colt eats cotton stalks and dried cornstalks he enjoys it. He may eat them because he has to. Nothing responds to feed like a colt, and, conversely, nothing responds more quickly to its absence. Stunt the colt after weaning, refuse to feed him, and you have a stunted horse or mule, undersized at maturity. The feed box and good blood go hand in hand, the one supplementing the other. It is a hopeless, cheerless, profitless proposition to separate them.

LIST OF CERTIFIED STUDBOOKS.

*List of studbooks, with names of associations and secretaries, certified by the Secretary of Agriculture, January 1, 1907.**

HORSES.

Name of breed.	Book of record.	By whom published.
American Trotter	American Trotting Register..	American Trotting Register Association, William H. Knight, secretary, 355 Dearborn street, Chicago, Ill.
Belgian Draft	American Register of Belgian Draft Horses.	American Association of Importers and Breeders of Belgian Draft Horses, J. D. Conner, Jr., secretary, Wabash, Ind.
Cleveland Bay	American Cleveland Bay Studbook.	Cleveland Bay Society of America, R. P. Stericker, secretary, 80 Chestnut avenue, West Orange, N. J.
Clydesdale	American Clydesdale Studbook.	American Clydesdale Association, R. B. Ogilvie, secretary, Union Stock Yards, Chicago, Ill.
French Coach	French Coach Studbook.....	French Coach Horse Society of America, Duncan E. Willett, secretary, Maple avenue and Harrison street, Oak Park, Ill.
Do.....	French Coach Horse Register.	French Coach Horse Registry Company, Charles C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.
French Draft	National Register of French Draft Horses.	National French Draft Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.
German Coach	German, Hanoverian, and Oldenburg Coach Horse Studbook.	German, Hanoverian, and Oldenburg Coach Horse Association of America, J. Crouch, secretary, La Fayette, Ind.
Hackney	American Hackney Studbook.	American Hackney Horse Society, A. H. Godfrey, secretary, Tichenor-Grand Building, Sixty-first street and Broadway, New York, N. Y.
Morgan	American Morgan Register ..	American Morgan Register Association, H. T. Cutts, secretary, Middlebury, Vt.
Oldenburg.....	Oldenburg Coach Horse Register.	Oldenburg Coach Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.
Percheron	Percheron Stud book of America.	Percheron Society of America, George W. Stubblefield, secretary, Union Stock Yards, Chicago, Ill.
Do.....	Percheron Register.....	The Percheron Registry Company, Chas. C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.
Do.....	The American Breeders and Importers' Percheron Register.	The American Breeders and Importers' Percheron Registry Company, John A. Forney, secretary, Plainfield, Ohio.

* Since this article was written the Welsh Pony and Cob Society of America, John Alexander, secretary, Aurora, Ill., has been certified.

List of studbooks, with names of associations and secretaries, etc.—Continued.

HORSES—Continued.

Name of breed.	Book of record.	By whom published.
Saddle Horse	American Saddle Horse Register.	American Saddle Horse Breeders' Association, I. B. Nall, secretary, Louisville, Ky.
Shetland Pony	American Shetland Pony Club Studbook.	American Shetland Pony Club, Mortimer Levering, secretary, La Fayette, Ind.
Shire	American Shire Horse Studbook.	American Shire Horse Association, Chas. Burgess, sr., secretary, Wenona, Ill.
Suffolk	American Suffolk Horse Studbook.	American Suffolk Horse Association, Alex. Galbraith, secretary, Janesville, Wis.
Thoroughbred.....	American Studbook.....	The Jockey Club, James E. Wheeler, registrar, 571 Fifth avenue, New York, N. Y.

ASSES.

Jacks and Jennets.....	American Jack Stock Studbook	American Breeders' Association of Jacks and Jennets, J. W. Jones, secretary, Columbia Tenn.
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INVESTIGATIONS IN ANIMAL NUTRITION.

By HENRY PRENTISS ARMSBY, Ph. D., LL. D.,

Director Pennsylvania State College Institute of Animal Nutrition; Expert in Animal Nutrition, Bureau of Animal Industry.

INTRODUCTORY.

It has been estimated by competent authorities that animal foods and dairy products together constitute over 45 per cent of the average food consumption of the industrial, commercial, and professional classes in the United States. When we take into account the generally higher prices of these materials, we are safe in saying that over 50 per cent of the expenditure for food by the average well-to-do family is for this class of materials. Moreover, whatever in the light of recent discussion may be our attitude toward vegetarianism or our judgment as to the necessary proteid supply, it is certainly a fact, however we may explain it, that those peoples are, as a whole, most efficient which consume a reasonable proportion of animal food.

To meet this demand for animal food there were killed in this country in 1906 many millions of meat animals. With exports added, the cattle, including calves, numbered 18,809,000; the sheep, including lambs, 24,548,000; and the swine, 50,145,000; or a total of 93,502,000 meat animals of the three classes mentioned. These are the figures of the Report of the Secretary of Agriculture for 1906. The total farm value of these animals was \$649,000,000, computed at the average value per head as ascertained by the census. Adding to this the value of our dairy products in 1899, stated by the census to be \$472,000,000, and that of poultry and egg production, about \$281,000,000, we have a total of about \$1,402,000,000 for the yearly farm value of the output of animal foods seven or eight years ago.

These enormous sums represent to a considerable extent the indirect utilization of what would otherwise be waste energy. The food of man is in a very real sense the fuel of the body—that is, it supplies energy for its vital activities. In the consumption of animal food man is to a large degree utilizing through the medium of the animal the energy of inedible products which otherwise would be an entire waste so far as food value is concerned. This is true on the one hand of the leaves, stems, husks, pods, etc., of our various farm crops—the so-called coarse fodders—and on the other, of those manufacturing by-products which accumulate in the preparation of

grains and other raw materials for human consumption. By feeding these products to our domestic animals we utilize for feeding man or performing his work a portion of their stored-up energy which would otherwise be practically lost. Of course surplus edible products are also utilized in stock feeding, and in this country very largely so. This, however, can only be regarded as a temporary phase of our agriculture. While on the fertile soil of the corn belt it is often found more profitable to convert corn into beef or pork than to market it directly, as the density of population and the demand for breadstuffs increase the stock feeder will be more and more constrained to the use of the cheaper by-product feeds in the place of grain. From the economic point of view, then, it is highly important that that portion of our national wealth represented by these inedible products should be utilized to the best advantage, yielding a greater aggregate profit to the producer and a more liberal supply of animal food to the consumer.

In view of the great economic importance of this subject the Bureau of Animal Industry is making, in cooperation with the Institute of Animal Nutrition of the Pennsylvania State College, a study of the scientific principles underlying the profitable conversion of stock foods into animal products fitted for the nutrition of man. Some of the results already reached have been characterized by a leading German authority as of fundamental significance, and the Association of American Agricultural Colleges and Experiment Stations has by formal resolution urged the importance of continuing and developing these investigations to the fullest practicable extent. For the prosecution of these researches a costly and unique apparatus known as the respiration calorimeter has been constructed. By means of this apparatus and its accessories it is possible to determine exactly not only the amounts of digestible matter and potential energy contained in the food of the animal, but also the use which the organism makes of these. The experiments include chemical analyses of the feeding stuffs used and of the visible excreta, and determinations of their heats of combustion, a determination of the gases given off in the respiration of the animal, and the amount of heat which the latter produces. The apparatus is modeled after the one for experiments in human nutrition devised by Atwater and Rosa, but has been made large enough for experiments upon fully mature cattle.

Work upon the apparatus was begun in the fall of 1898. In addition to the numerous problems of construction involved in the considerable enlargement of the apparatus, other questions had to be solved. Thus no cooperation could be had from the subject of the experiment, but everything relating to the conditions inside the apparatus must be adjustable by the observer from without. Moreover, for experiments with cattle large amounts of bulky feed and

excreta had to be introduced into or removed from the apparatus. A further complication arose from the considerable production of combustible gases by ruminating animals, rendering it necessary to provide special means for their determination.

DESCRIPTION OF THE APPARATUS.

The general plan of the apparatus is substantially that of the Atwater-Rosa apparatus; that is, it is a Pettenkofer respiration apparatus, the chamber of which serves also as a calorimeter. The original Middletown apparatus has been fully described in Bulletins 63 and 136 of the Office of Experiment Stations, United States Department of Agriculture, and the reader is referred to those publications for details on many points.

The respiration chamber of the Pennsylvania apparatus is constructed of sheet copper, and measures 6 feet by 10 feet 4 inches and 8 feet high. A platform 21 inches above the base of the chamber carries the stall in which the animal stands. Beneath the rear portion of this stall is a small chamber of sheet copper about 34 by 67 inches, entirely shut off from the rest of the respiration chamber except for two holes through the platform, and having a separate air-tight door. Through one of the holes mentioned a rubber tube leads from the urine funnel to a receptacle of tinned copper; to the other hole is attached a large rubber duct covering the hind quarters of the animal, and underneath it is placed a galvanized-iron box, tightly pressed against the lower side of the platform, to receive the droppings of the animal. This small chamber, therefore, has only such air connection with the remainder of the chamber as is unavoidable through the openings around the two ducts, but is in thermal communication with it through its copper walls. The operation of opening the air-tight door, removing the excreta and replacing the receptacles occupies not more than a minute or two, and it is assumed that any error thus introduced is insignificant.

At the other end of the platform is the feed box. This is provided with an air-tight cover, which can be opened or closed by means of a lever operated from outside, and is also provided with an air-tight door. By lowering the cover the feed box can be entirely shut off from the chamber. The air-tight door can then be opened for the introduction of feed or the removal of residues, the door closed, and the lid again lifted. The arrangement constitutes, in brief, an air lock and is substantially like that employed in the respiration apparatus of the Moeckern Experiment Station. The water supply is introduced into a small drinking basin at the side of the feed box by means of a pipe carried through the calorimeter wall, the water being weighed in and any excess removed by drawing the water in the pipe down to a fixed level.

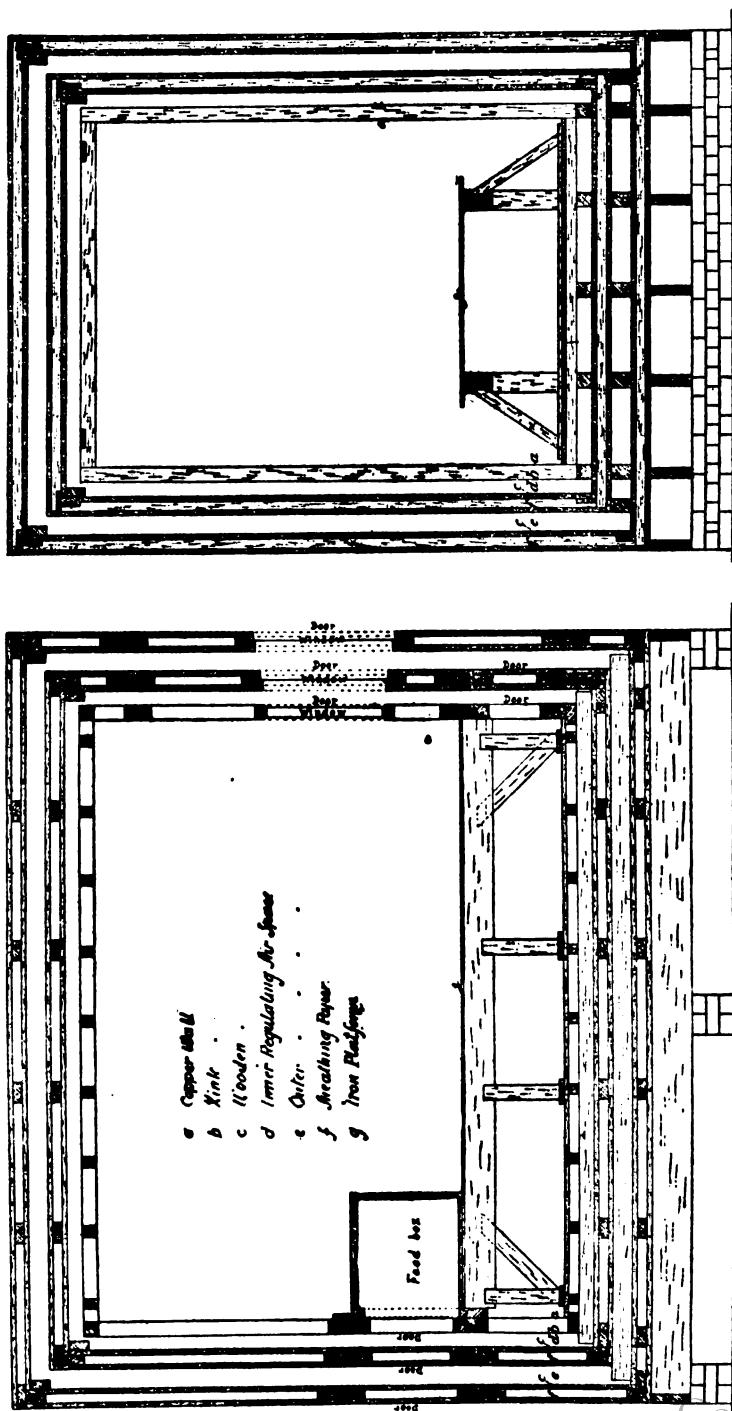


FIG. 2.—The respiration calorimeter, vertical cross section.

The large door at the rear of the apparatus through which the animal enters and the two small doors giving access, respectively, to the feed box and excreta have heavy oak frames and are made tight by means of gaskets composed of rubber tubing, the doors being kept in place by means of pressure catches such as are frequently used on large refrigerators.

THE RESPIRATION APPARATUS.

Through the chamber above described a current of outdoor air is aspirated by means of a special pump (Pl. XXIII), the air first passing over the expansion coils of an ice machine, where most of its moisture is deposited as frost. At the point of entry to the chamber samples are taken alternately by one or the other of two large aspirators of constant flow at the rate of 200 liters in twelve hours. In these samples moisture and carbon dioxid are determined by passing them through U tubes containing sulphuric acid and soda lime.

From the chamber the air passes to the meter pump, which serves both to maintain the air current and to measure and sample it. This meter pump, which was designed and built especially for this apparatus by Mr. Frederick Hart, of Poughkeepsie, N. Y., acts upon the same principle as the Blakesley meter pump used in the Atwater-Rosa apparatus, but differs materially from it in mechanical details. A full description of it has been published.^a The pump consists essentially of two cylinders of drawn-steel tubing, 19 inches in diameter, moving up and down in mercury. The pump is adjustable to three different lengths of stroke and four speeds. As thus far used, it has been set to deliver approximately 50 liters per stroke (exactly, 49.539) and has been run at the rate of about 14 strokes per minute, the total ventilation, therefore, being about 700 liters per minute. The number of strokes as recorded by a revolution counter, with the corrections for temperature and pressure, gives the total volume of air passing through the apparatus, and the results of the analysis of the ingoing air, calculated upon this volume, give the weights of water and carbon dioxid carried into the apparatus by the current of air.

By means of a shunt valve connected with an ingenious train of gearing one stroke is delivered at regular intervals alternately through one or the other of two special outlets. The pump can be set to deliver thus one stroke in 200, one in 400, or one in 800. The two aliquot samples thus taken are conducted to two large pans having counterpoised rubber covers substantially like those used in the Atwater-Rosa apparatus. From these pans each sample separately is aspirated by means of a subsidiary air pump and passes through a set of six large U tubes (10½ inches), the first two containing pumice

^aAmerican Machinist, 25 (1902), p. 1297.

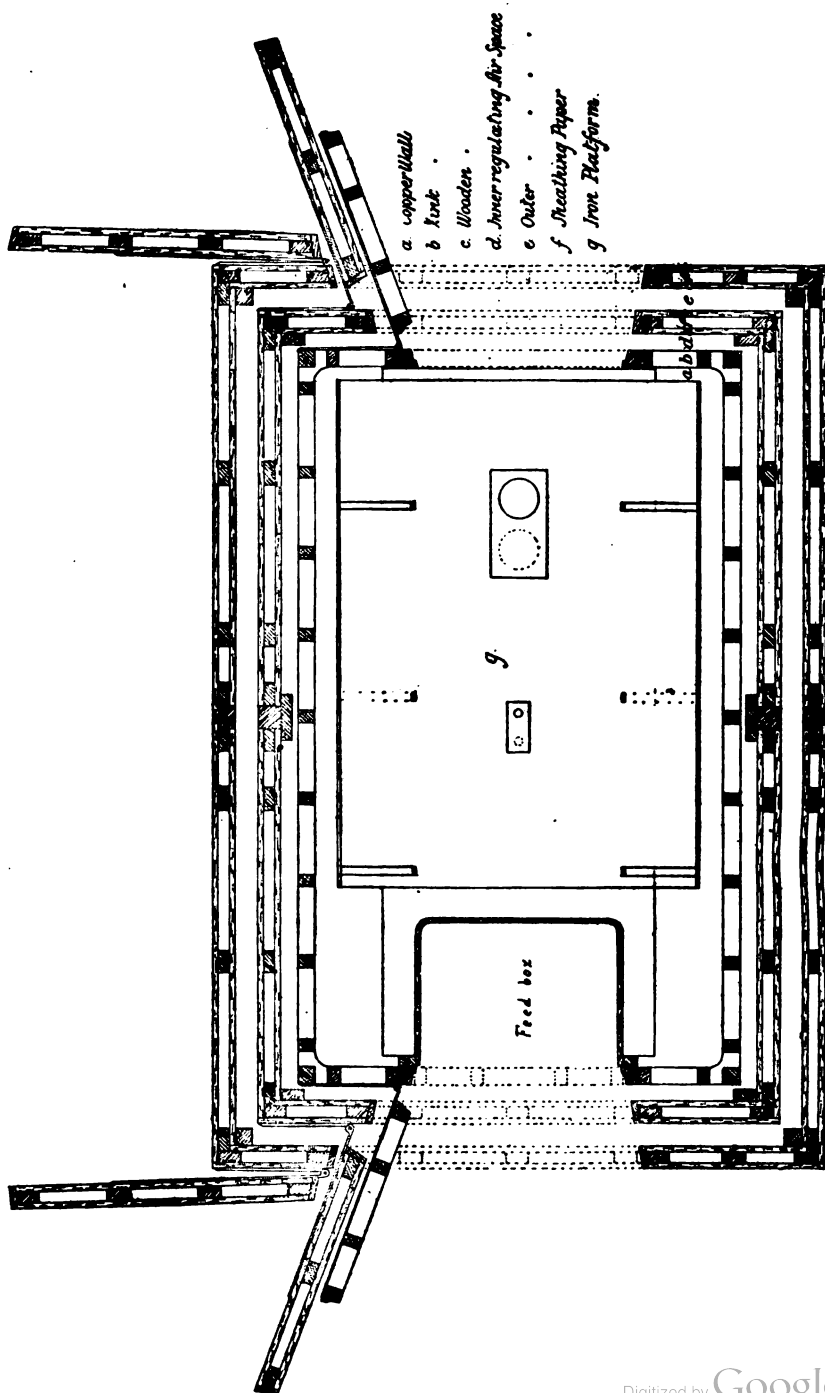


FIG. 3.—The respiration calorimeter, horizontal cross section.

stone saturated with sulphuric acid, the second two soda lime, and the last two pumice stone and sulphuric acid. The increase in weight of these tubes of course gives the amounts of water and carbon dioxid contained in the samples, and this amount multiplied by the proper factor gives the total amount contained in the outcoming air. Subtracting from this that contained in the ingoing air, determined as above described, gives the amounts added by the animal.

From the U tubes the air is conducted to the apparatus for determining the combustible gases excreted. This consists of a 1-inch copper tube, having an effective length of about 60 inches, filled with platinized kaolin and kept at a red heat by 64 gas-burners. In this tube the combustible gases are oxidized to carbon dioxid and water, which are absorbed and weighed in a second set of U tubes similar to the first. Many difficulties were experienced in securing satisfactory results with this part of the apparatus on account of the large volume of air to be handled ($3\frac{1}{2}$ liters per minute as ordinarily used) and the considerable force required to draw the air through the numerous absorption tubes. The connections with the combustion tubes are made with soldered joints, and the absorption tubes are carefully tested with the manometer before being used. The amount of platinized kaolin employed has been demonstrated to be sufficient to oxidize much larger amounts of methane than it will ever be required to in actual use.

No parallel determinations of combustible gases are at present made in the air entering the apparatus. The amounts have been shown to be very small in this locality and corrections are made for them from the results of numerous blanks.

THE CALORIMETER.

The arrangements for determining the heat given off by the animal are in all essentials like those of the Atwater-Rosa apparatus. The heat is absorbed by a current of cold water passing through copper pipes at the top of the respiration chamber, access of air to these pipes being regulated by means of shields which can be raised or lowered by the operator. The temperature of the ingoing and outcoming water is read every four minutes by means of two mercurial thermometers, graduated to $\frac{1}{10}^{\circ}$ C. and carefully calibrated. The volume of water passing through is measured by means of two copper meters, each containing 100 liters. The apparatus is so arranged that the weight of the heat absorbers may be taken from outside, any condensation of moisture upon them being thus indicated.

The respiration chamber proper of the apparatus is a metallic chamber of the dimensions stated above. Surrounding this, with an air space of 4 inches between, is a double wooden wall, which in turn

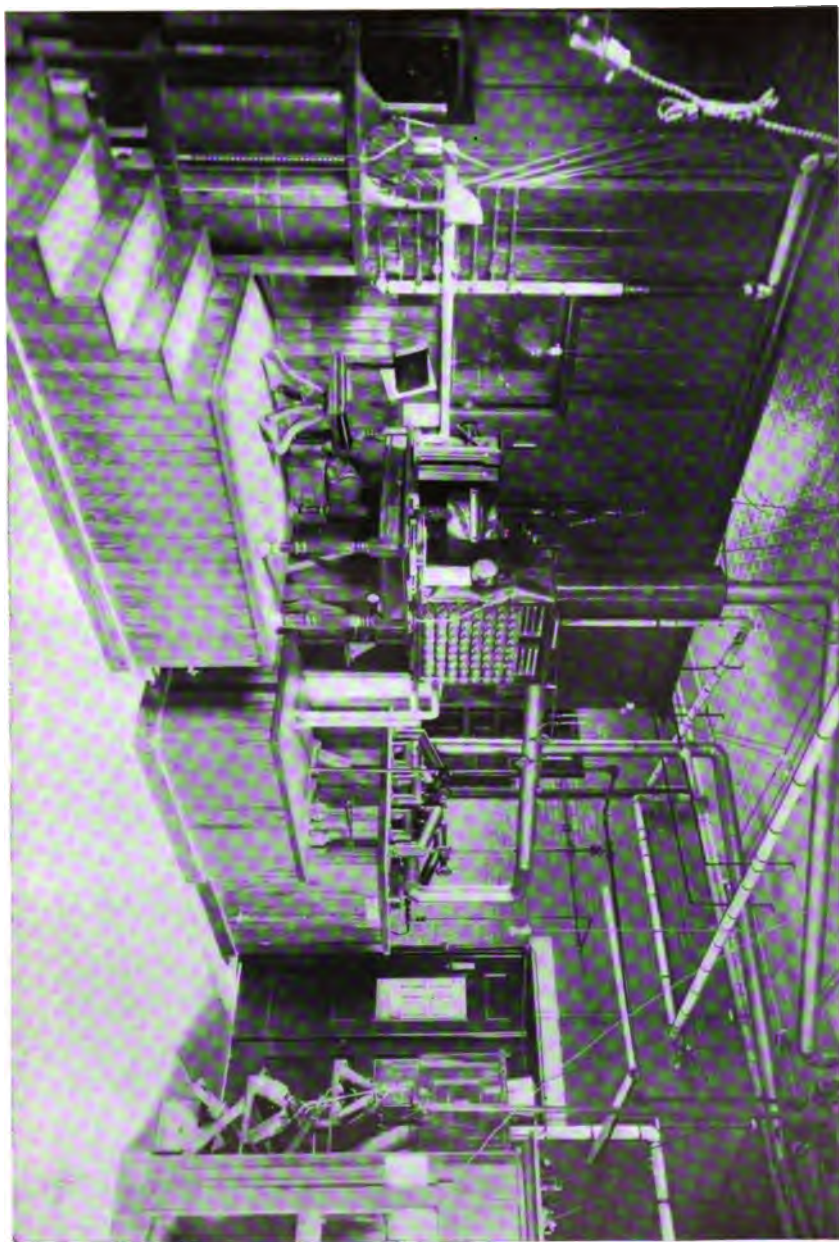
is surrounded by a second wall and air space of 4 inches. The walls of the respiration chamber proper are double, the inner of copper and the outer of zinc, with a 3-inch dead air space between, and through these walls are distributed some 600 iron German-silver couples connected in series with a reflecting galvanometer and serving to indicate any difference in temperature between the inner (copper) and outer (zinc) surface. Any such difference is rectified and the walls of the chamber maintained adiabatic by heating or cooling the air space surrounding the zinc wall—the former by means of an electric current through resistance wires and the latter by circulating cold water through brass pipes (Pl. XXIV). The double wooden wall surrounding the metallic chamber also contains a smaller number of iron German-silver couples, and is in its turn kept nearly adiabatic by regulating the temperature of the second air space. By means of very similar devices the temperature of the ingoing air is maintained the same as that of the outcoming air.

The temperature of the interior of the apparatus is measured by means of a series of copper resistance thermometers connected to a slide-wire Wheatstone bridge, and also by means of two mercurial thermometers. By raising or lowering the shields or varying the flow of water through the absorbers the rate at which heat is removed through the water current may be so regulated as to keep the temperature of the interior constant within very small limits, while the slight variations are made to balance each other in the course of an experiment, so that there is practically no capacity correction. Under these conditions, all the heat evolved by the animal must leave the apparatus either as sensible heat in the water current or as the latent heat of water vapor.

In practice, of course, corrections have to be made for any heat introduced or removed as sensible heat in the feed, excreta, etc. The friction of the water in the coil of copper pipes is also the source of a minute amount of heat, which is computed from the volume of water and the fall in pressure in passing through the pipes. This difference in pressure also affects slightly the readings of the thermometers, tending to make those in the ingoing water relatively higher than those in the outcoming water. The small correction for this difference has been determined experimentally within the range of pressures used.

THE BUILDING.

The building in which the apparatus is housed is of brick, with heavy walls containing an air space to aid in maintaining uniform temperature. The floor is of concrete, and the ceiling high enough to leave about $3\frac{1}{2}$ feet clear space above the top of the respiration chamber, which stands upon three brick piers about 18 inches above

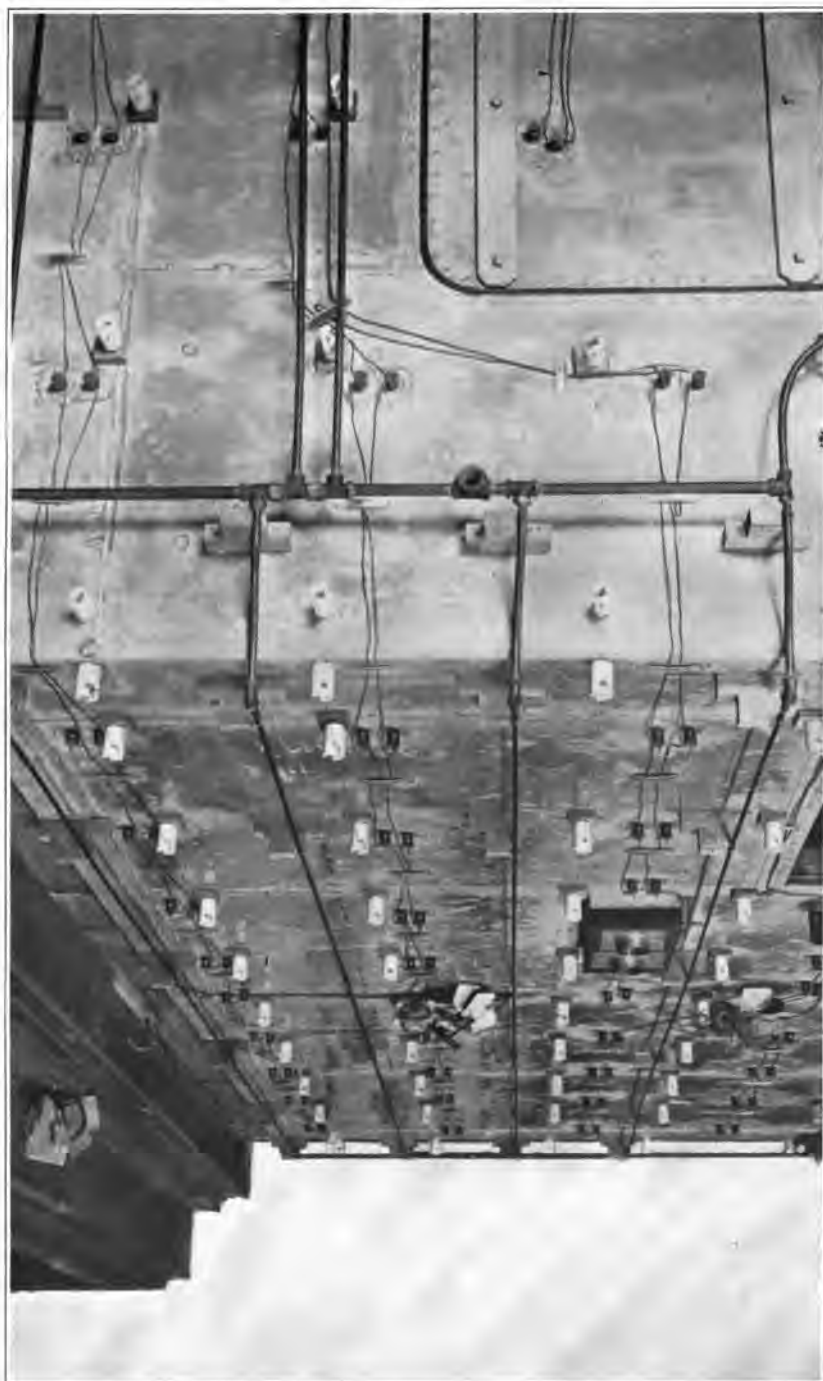


THE RESPIRATION CALORIMETER.



THE METER PUMP AND ABSORPTION TUBES.

ARRANGEMENT OF HEATING WIRES, COOLING PIPES, ETC.



the floor of the room. In this way any difficulty arising from differences in temperature at different points in the room has been avoided.

METHOD OF EXPERIMENTS.

The experiments thus far made have been of forty-eight hours' duration, this period being divided into subperiods of twelve hours each. The animal is placed in the apparatus five or six hours before the beginning of the experiment, which has been conveniently placed at 6 p. m. By this time the apparatus has come into equilibrium, and it is only necessary to shift the current of air from one set of cans and absorption apparatus to another in order to begin the experiment.

The experiments have followed each other at an average interval of from two to three weeks. During the intervening time the animal stands in an adjoining room in a stall which is provided with appliances for the quantitative collection of the visible excreta. An actual experiment requires the services of at least seven men, exclusive of the assistant in charge of the feeding and collection of excreta.

INTERPRETATION OF RESULTS.

A feeding experiment conducted with the aid of the respiration calorimeter is not fundamentally different from one made according to simpler and more familiar methods. In both cases we attempt to compare the results obtained, either from two or more rations under identical conditions or from identical rations under differing but controlled conditions. The difference lies in the extent to which we are able to control the conditions and in the accuracy and minuteness with which it is possible to compare the rations and their results.

The simplest and most obvious form of feeding experiment is that in which the amounts of feed consumed are noted and their effects measured by the increase in the live or dressed weight of the animal or by the weight of milk or wool produced. This method, when skillfully carried out with a considerable number of animals and under the conditions of actual practice, is particularly adapted, and, indeed, may be said to be indispensable, to the study of the economic aspects of stock feeding.

But while this is true, it is also the fact that no considerable or profound knowledge of the principles of feeding can be gained by means of experiments of this class. The factors entering into the problem are too complex. Chemistry has shown that each one of the feeding stuffs consumed consists of a great variety of substances—useful, indifferent, and even injurious—mingled in the most diverse and varying proportions, while physiological investigation has demonstrated not only the considerable and irregular fluctuation of live

weight from day to day, but especially that a given increase or decrease may be of very varying significance according as it consists of proteid tissue, fat, mineral matter, or simply water. The result of a live-weight experiment, therefore, may be the resultant of any one of many possible combinations of these factors, and no safe conclusion as to its actual cause is usually possible. The history of this class of experiments amply corroborates this conclusion. Great accumulations of experimental data have been made, but relatively few general conclusions have issued from them.

The earliest step in advance was the attempt to separate the factor "food" into its elements. Of these attempts, the one which has secured general acceptance is the familiar one of Henneberg, which groups the chemical ingredients of feeding stuffs into "protein," "carbohydrates," "fat," and "ash," subdividing the carbohydrates into "crude fiber" and "nitrogen-free extract," and distinguishing further between the digestible and the indigestible portions of each group. A great mass of investigation along these lines in the laboratory and digestion stall has materially enlarged our knowledge of feeding stuffs, although much still remains to be done. It is now a comparatively easy matter, by the familiar methods of the digestion experiment, to determine with a fair degree of accuracy the so-called "digestible nutrients" consumed in the several periods of a feeding experiment and thus to secure a more rational basis of comparison. To the conventional determinations it is of course easy to add others, such as that of amids, pentosans, etc., and particularly the heat of combustion.

Analyses and digestion experiments as ordinarily conducted, however, afford no *direct* information whatever as to the effect of the digested matters in supporting the animal or producing gain. It is not even necessary to weigh the animal in a digestion experiment. The conclusion as to the nutritive value of the feeding stuff is simply an inference based on general physiological facts, and its correctness is more than questionable in the light of recent investigation. It is only as we determine the actual changes brought about by a ration in the store of matter or of potential energy contained in the body that we can reach a scientifically accurate determination of the nutritive value of that ration. Unless we do this, no matter how accurately we analyze the feeding stuffs supplied or determine their energy, the second member of the equation is lacking. We stand in urgent need of actual determination by modern methods of the nutritive values of feeding stuffs for different purposes, the results of which we may substitute for the assumptions on which we are now basing our teachings, and it is such determinations for which the respiration calorimeter is designed.

The basis of the method is Henneberg's conception of the schematic body. This is, in brief, that for this particular purpose the animal body may be regarded as composed of water, ash, protein, and fat, each of practically invariable elementary composition, and the effect of a ration is expressed by the gain or loss of ash, protein, fat, and, of course, water, by the body of the animal. This gain or loss may be determined by comparing the amounts of ash, nitrogen, and carbon in the food with those contained in the various excreta—solid, liquid, and gaseous; that is, by a so-called balance experiment. For example in an experiment with a steer the ration consisted of 4,531 grams of timothy hay and 400 grams of linseed meal, and the following figures for daily nitrogen and carbon were obtained:

TABLE 1.—*Nitrogen and carbon balance.*

Material.	Nitrogen.		Carbon.	
	Income.	Outgo.	Income.	Outgo.
	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>
Hay.....	23.4		1,337.6	
Linseed meal.....	22.2		172.5	
Feces.....		16.2		649.8
Urine.....		36.3		88.1
Hair, etc.....		1.3		8.0
Carbon dioxide.....				984.1
Methane.....				55.2
Lost by body.....	8.2		225.1	
Total.....	53.8	53.8	1,735.2	1,735.2

From the known composition of the proteids and fat of the body it is easy to compute that the loss of 8.2 grams of nitrogen and 225.1 grams of carbon is equivalent to a loss of 49.2 grams of proteids and 259 grams of fat.

Still another method of comparison is afforded when we turn from considering the food as a supply of matter and regard it as the source of energy to the vital machinery.

The potential energy of feed and visible excreta is measured by their heats of combustion, which are readily determined by means of the bomb calorimeter. The production of heat by the animal is determined directly by the respiration calorimeter. Adding to these data the heat of combustion of the methane excreted, which is readily computed from its amount, we have all the data for the construction of a balance of energy similar to the balance of matter. In the case selected as an example this was:

TABLE 2.—*Balance of energy.*

Material.	Income.	Outgo.
	<i>Calories.*</i>	<i>Calories.*</i>
Hay.....	12,085	
Linseed meal.....	1,824	
Feces.....		6,432
Urine.....		853
Methane.....		964
Hair, etc.....		88
Heat produced by steer.....		9,215
Loss of energy by steer.....	2,713	
Total.....	17,672	17,572

* The calorie here used is the large calorie (kilogram-calorie) (often written with a capital C). A calorie is the amount of heat required to raise the temperature of 1 kilogram (2.2 pounds) of water 1 degree Centigrade, or about 4 pounds of water 1 degree Fahrenheit.

Out of a total of 14,859 calories of energy in the food, 8,357 calories reappeared as unused potential energy in the various excreta. The remainder, 6,502 calories, was used to support the vital activities of the body, and these required in addition 2,713 calories of energy, which was supplied by the oxidation of body tissue. The 49.2 grams of protein lost by the body would supply for this purpose 280 calories and the 259 grams of fat 2,461 calories, or a total of 2,741 calories, which is practically the same as the amount computed from the energy balance.

By means of determinations of this sort, then, we are able to compare the actual effects of feeding stuffs or rations upon the animal body with a far higher degree of exactness than in any other manner now available. In particular, results of this sort serve as a basis for determining the energy values of feeding stuffs.

ENERGY VALUES.

In recent years considerable study has been made of the value of foods and feeding stuffs as sources of energy to the body. This method of studying foods is based upon a consideration of their two primary functions. The first of these is the production of tissue. The value of a food for this purpose we believe to be measured substantially by its content of digestible proteids. In the case of mature animals, however, a comparatively small amount of proteids is needed to maintain the stock in the body, and even growing animals, and milking animals, while they require more proteids, do not demand relatively very large quantities.

Aside from this, the main function of the food is to furnish energy for the bodily functions. It was natural, therefore, to hope that the amount of potential energy contained in a feeding stuff might afford a more accurate measure of its relative feeding value

than does its content of "digestible nutrients" of uncertain chemical composition.

The method of determining these energy values may be conveniently illustrated by the results which have been reached in these investigations upon three feeding stuffs, namely, a coarse timothy hay, clover hay, and corn meal, with the addition also for the sake of comparison of the average of Kellner's results upon seven samples of German meadow hay. The following tables show the percentage composition of these feeding stuffs and the percentages of digestible nutrients as actually determined in the ordinary manner:

TABLE 3.—*Composition of feeding stuffs.*^a

Constituent.	Timothy hay.	Clover hay.	German meadow hay."	Corn meal.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Water.....	15.00	15.00	15.00	15.00
Ash.....	3.94	5.58	6.09	1.23
Proteids.....	4.34	9.50	7.64	8.67
Nonproteids.....	0.20	0.76	0.86	0.25
Crude fiber.....	33.08	24.46	25.68	1.86
Nitrogen-free extract.....	41.67	42.21	42.72	69.40
Ether extract.....	1.77	2.49	2.01	3.59
Total.....	100.00	100.00	100.00	100.00

^a Computed to uniform water content for comparison.

TABLE 4.—*Digestible nutrients.*

Nutrient.	Timothy hay.	Clover hay.	"Meadow hay."	Corn meal.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Proteids.....	1.57	5.13	3.87	5.76
Carbohydrates.....	44.06	42.24	43.65	68.44
Fat.....	.63	1.59	.97	3.44
Total nutrients (fat \times 2.25).....	47.05	50.95	49.70	81.94
Relative value.....	1.00	1.08	1.05	1.74

FUEL VALUES.

Considerable investigation has been devoted to determinations of the so-called "fuel values" of foods and feeding stuffs.

By "fuel value" in this sense is meant the amount of heat which the material is capable of generating in the body. The significance of the term may be illustrated by the results of one of our own experiments upon clover hay. In this experiment 10.53 pounds^a of clover hay were eaten by a steer. A direct determination of its heat of combustion showed that this quantity of hay was capable of producing, when completely burned, 18,535 calories of heat. When the animal had come into equilibrium with this ration, the dung and

^a Computed to 15 per cent water content.

urine were carefully collected and weighed and their heats of combustion determined, and the excretion of marsh gas was measured by the respiration calorimeter. In Table 5 are contained the results of these several determinations. From these it appears that out of the 18,535 calories of energy contained in the hay, 9,921 calories were lost in the unoxidized excreta. The remainder, 8,614 calories, is the so-called "fuel value" of the hay, since it is equivalent to the amount of heat (or other form of energy) which it is capable of liberating in the body of the animal.

TABLE 5.—*Fuel value.*

Energy of food:	Calories.
10.53 pounds of clover hay-----	18,535
Energy of excreta:	Calories.
16.70 pounds dung-----	7,666
10.28 pounds urine-----	1,202
.174 pound marsh gas-----	1,053
Total excreta -----	9,921
Fuel value-----	8,614
Fuel value per pound-----	818

Similar determinations were made upon the timothy hay and corn meal and by Kellner upon seven different lots of German "meadow hay." The average results of these determinations are tabulated in Table 6, including also the amount of digestible proteids per pound, as given in Table 4.

TABLE 6.—*Fuel values per pound (with 15 per cent moisture).*

Feeding stuff.	Digestible proteids.	Fuel value.
	Pounds.	Calories.
Timothy-----	0.016	777
Clover hay (average of three periods)-----	.051	802
German "meadow hay"-----	.039	792
Corn meal-----	.068	1,308

It should be expressly noted that the figures of the above table are derived from experiments on cattle, and, strictly speaking, apply only to that species. It is probable, however, that they are substantially correct for other ruminants, but not for the horse or the hog.

ISODYNAMIC REPLACEMENT.

Since the fuel values show how much of the total energy of the food can be set free in the body, it was natural to assume that these fuel values are a measure of the food value so far as the supply of energy is concerned. This conclusion was all the more natural since the larger share of the energy liberated in the body finally takes the

form of heat, and since a supply of heat is necessary in order to maintain the body temperature. In particular, since an animal on a maintenance ration is practically producing nothing but heat, it has been assumed that the fuel value of a feeding stuff is the measure of its value for maintenance, provided it contains the necessary amount of proteids. This assumption was largely based upon Rubner's earlier investigations upon the so-called isodynamic replacement of nutrients. In brief, Rubner showed in experiments with dogs and other animals that at or below the maintenance requirement nearly pure nutrients could be substituted in the metabolism of the animal for each other or for the ingredients of body tissue, and that they were valuable for this purpose approximately in proportion to their fuel values as above defined. These results of Rubner's have passed into the literature of the subject, and have been brought prominently before the American public by the writings of Atwater and his associates. Rubner found the fuel values of the nutrients of the mixed diet of man to be approximately 1 pound digestible protein and 1 pound digestible carbohydrates, each 1,860 calories, and 1 pound digestible fats, 4,220 calories, and Atwater subsequently obtained substantially the same results in a more extended investigation of the subject. It has been quite generally assumed that these figures represent not only the nutritive values of human foods, but likewise those of the digestible matter of stock foods, at least for purposes of maintenance.

Such a substitution in the body of one kind of fuel for another as is implied by the law of isodynamic replacement means, of course, that the total heat production is not affected by the kind or amount of food, at least within the limits of the maintenance requirement. On the other hand, it is an observation as old as the time of Lavoisier that the consumption of food tends to increase the heat production, and it has been well established by the investigations of Zuntz and others that there is a not inconsiderable expenditure of energy in the digestion and assimilation of the food, which ultimately assumes the form of heat in the body. The energy thus expended is not available for the general purposes of the organism, and accordingly we should expect that the actual nutritive value of a food would be less than its fuel value in proportion to the amount of digestive work caused by it.

In our experiments the actual effects of the feeding stuffs in maintaining the body have been compared with their fuel values and in each case found to be materially less. Thus in the experiment whose results are given in Table 5 the ration of hay was insufficient and the animal lost considerable amounts of both protein and fat from its body, as was shown by the determinations with the respiration calo-

rimeter. These losses of protein and fat were equivalent to a loss of 2,391 calories of the potential energy stored up in the tissues of the body.

In the period immediately preceding this the animal received 12.91 pounds^a of the same hay, and the loss of protein and fat by the animal per day was equivalent to a loss of 878 calories of potential energy. As compared with the period first described, the increased amount of hay fed diminished the daily loss from the body by 1,513 calories. In Table 7 is shown the actual fuel value of the ration of each period compared with the resulting loss from the body of the animal.

TABLE 7.—*Maintenance value of clover hay.*

Period.	Fuel value.	Loss by animal.
Period I.....	<i>Calories.</i> 10,690	<i>Calories.</i> 878
Period II.....	8,614	2,391
Difference.....	2,076	1,513

The addition of hay having a fuel value of 2,076 calories diminished the loss by the animal by only 1,513 calories. In other words, but 72.9 per cent of the fuel value of the added hay was available for the purpose of maintenance, while the rest was simply converted into heat and served, as far as appears, no useful purpose, since the animal's temperature was maintained on the smaller ration.

Similar trials with timothy hay and corn meal gave similar results, 62.92 per cent of the fuel value of the timothy hay and 77.76 per cent of that of the corn meal proving available for maintenance, while the remainder, as in the case of clover hay, simply caused an increased heat production by the animal. The results are exactly of the same nature as those on clover hay and show that only a part of the fuel value was available for the maintenance of the animal. No similar results are available for the "meadow hay."

In other words, the law of isodynamic replacement did not hold in these experiments. The digested food was not isodynamic with body substance, nor did the digestible nutrients of the feeding stuffs replace each other in the proportions demanded by that law.

MAINTENANCE VALUES.

By the use of the percentages just given we may evidently compute from the fuel values as given in Table 6 the corresponding maintenance values. For example, that table shows the fuel value of a pound of timothy hay to be 777 calories. According to the figures

^a Computed to 15 per cent water content.

just given, 62.92 per cent of this is available for maintenance. We have therefore as the maintenance value

$$777 \text{ calories} \times 0.6292 = 489 \text{ calories.}$$

The results of this computation are contained in the following table, in which they are expressed in calories and also relatively, taking that for timothy hay as unity.

TABLE 8.—*Fuel values and maintenance values per pound.*

Feeding stuff.	Computed from digestible nutrients.	Actual fuel values.	Maintenance values.
Absolute values:	<i>Calories.</i>	<i>Calories.</i>	<i>Calories.</i>
Timothy hay.....	875	777	489
Clover hay.....	948	802	585
Corn meal.....	1,525	1,308	1,016
Relative values:			
Timothy hay.....	1.00	1.00	1.00
Clover hay.....	1.08	1.08	1.20
Corn meal.....	1.74	1.68	2.11

WORK OF DIGESTION AND ASSIMILATION.

It is very clear from the above results that the maintenance values of these feeds are not only much lower than their fuel values, but are not proportional to them nor to the digestible nutrients. The explanation of this wide difference lies in the fact that a considerable part of the fuel value of the food eaten is consumed in those processes which are necessary to prepare the food for the use of the body. These processes may be broadly divided into three classes:

First, a certain amount of muscular exertion is required to grasp, chew, and swallow the food and to move it through the alimentary canal. The energy thus expended is ultimately derived from the food and finally assumes the form of heat.

Second, quite extensive fermentations and putrefactions of the food occur in the alimentary canal, and in these, again, a considerable portion of the food energy takes the form of heat.

Third, more or less chemical change is necessary to convert the digested materials into forms suited to nourish the cells of the body, while it is not improbable that certain ingredients of the digested food are not assimilable in this sense, but are simply burned to get rid of them.

In all these ways more or less of the energy of the food, as measured by its fuel value, is converted into heat, and when it once takes this form it is of use only in so far as it may be needed to keep the body warm, while it can not be used to replace lost tissue or to build up new. The total expenditure of energy in these processes has been designated as the "work of digestion and assimilation." It includes

all the processes necessary or incidental to the conversion of food into nutrient material in the body. The case is analogous to that of a steam boiler which is fired by means of a mechanical stoker driven by steam from the same boiler. Each pound of coal fed into the fire box is capable of evolving a certain amount of heat, representing its fuel value in the above sense, and that heat is capable of producing a certain quantity of steam. A definite fraction of the latter, however, is required to introduce the next pound of coal into the fire box and therefore is not available for driving the main engine.

As already noted, the expenditure of energy in this way has been the subject of considerable investigation, notably by Zuntz and his associates.* In particular they have called attention to the marked difference in this respect between the coarse fodders and grains which is indicated by our own results just quoted. The coarse and woody nature of roughage and the extensive fermentations which it undergoes in the digestive tract of the ruminant both cause a much larger loss of energy than is the case with concentrated feeds. The importance of this fact in relation to productive feeding has been more or less recognized in recent years, but that it affects also the maintenance value has not before been clearly demonstrated.

Like the fuel values given above, these maintenance values have been obtained in experiments upon cattle and apply specifically only to that species, although we may surmise that they will prove to be approximately true for other ruminants.

RECAPITULATION.

In brief, then, the fuel value of a feeding stuff represents all the energy that can be liberated from it, either as heat or in other forms, in the body. This has sometimes been called metabolizable energy. Much of this fuel value, however, is either used up in the processes of digestion or in other ways converted into heat, and is therefore unavailable for the general purposes of the body. The maintenance value represents that remaining portion of the fuel value which is found by experiment to be available for the prevention of loss by the animal. This portion of the fuel value has sometimes been called net available energy. Quite recently Kellner has proposed for it the term "dynamic energy" and that of "thermic energy" for the energy dissipated as heat.

The above statements, however, require one qualification. Below a certain temperature, varying with the species of animal, the heat liberated during the digestion and assimilation of the food may be of use in maintaining the body temperature, and under these condi-

* Compare Experiment Station Record, Vol. VII, p. 538.

tions the fuel value would represent the actual energy value of the food. These were, in fact, substantially the conditions under which Rubner's earlier experiments were made and under which isodynamic replacement was observed. His later results^a have demonstrated that at higher temperatures the results obtained with dogs and other carnivorous animals are of the same general nature as those here reported. The data now at hand, however, indicate that, at least in most cases, cattle even on a maintenance ration and at comparatively low temperatures produce more heat than is absolutely necessary, and that therefore the amount coming from the work of digestion is superfluous.

THE PROTEID REQUIREMENTS.

In the above paragraphs we have been considering the food as a means of maintaining the store of energy in the body. It is of course equally important to maintain the stock of proteids in the body, and for this purpose an adequate supply of proteids in the food is indispensable. The total amount required for the maintenance of mature cattle, however, is so small relatively that it is only when feeds very poor in protein are used that there is danger of it falling short.

PRODUCTION VALUES.

The above figures relate to the value of feeding stuffs for simple maintenance—that is, for the prevention of loss of tissue. When food is given in excess of the maintenance ration more or less fattening of the animal results—that is, superfluous food is stored away in this form. It appears probable that in this conversion into fat there is a further loss of energy. This is at least indicated by results obtained here upon timothy hay and corn meal. The method of experimentation was substantially the same as that already described in the determination of maintenance values; that is, the food in question was added to a basal ration and the effect of the added food determined by means of the respiration calorimeter.

In this way it was found that the following percentages of the fuel value of the material added to the basal ration were stored up in the body as gain of protein and fat, chiefly the latter:

	Per cent.
Timothy hay-----	33.31
"Meadow hay"-----	41.50
Corn meal-----	53.30

Applying these percentages to the fuel values given in Table 6, we can add to the figures of Table 8 a column showing the production values for mature fattening cattle, as follows:

^a Gesetze des Energieverbrauchs bei der Ernährung. Google

TABLE 9.—*Fuel values, maintenance values, and production values, per pound.*

Feeding stuff.	Computed from digestible nutrients.	Actual fuel value.	Mainte- nance value.	Production value.
Absolute values:	<i>Calories.</i>	<i>Calories.</i>	<i>Calories.</i>	<i>Calories.</i>
Timothy hay.....	876	777	489	259
Clover hay.....	948	802	585	.....
"Meadow hay".....	926	792	.....	329
Corn meal.....	1,526	1,308	1,016	697
Relative values:				
Timothy hay.....	1.00	1.00	1.00	1.00
Clover hay.....	1.08	1.08	1.20	.....
"Meadow hay".....	1.06	1.02	.....	1.27
Corn meal.....	1.74	1.68	2.11	2.73

Assuming for the moment absolute accuracy in the results, these figures mean, for example, that 1 pound of timothy hay fed to cattle would be capable of liberating in the body a total of 777 calories of energy. Of this amount 489 calories would be available for maintenance; that is, when fed as part of a maintenance ration it would prevent the loss of an equal number of calories by the animal, while as part of a production ration it would cause a gain equivalent to 259 calories. Similarly, 1 pound of corn meal would be capable of liberating 1,308 calories of energy in the body, of which 1,016 calories would be available for maintenance, or 697 calories for the production of gain.

A gain of 1 pound of fat by the animal is equivalent to a gain of 4,220 calories of energy. Accordingly, the gain of 259 calories produced by 1 pound of timothy hay according to the above table would be equivalent to the gain of 0.061 pound of pure fat if the gain of dry matter were all in this form, while the maintenance value, 489 calories, would be equivalent to preventing a loss of 0.116 pound of fat from the body. Similarly, the gain of 697 calories produced by 1 pound of corn meal in excess of a maintenance ration is equivalent to 0.165 pound of fat, while the maintenance value of 1,016 calories would be equivalent to preventing a loss of 0.241 pound of fat.

As a matter of fact, of course, some of the gain by the fattening animal, as well as some of the loss on an insufficient ration, consists of other material than fat, and the advantage of stating the results in terms of energy is that it reduces all these gains and losses to a common measure.

Finally, these figures should not be confounded with the gains in live weight, which always include a considerable and varying amount of water.

SIGNIFICANCE OF RESULTS.

Plainly, if the results above tabulated are trustworthy, they give far more exact values than any heretofore available, and, strictly speaking, would enable us to predict the effect of a ration consisting

of these feeding stuffs. It is necessary, therefore, to call special attention to the fact that, with the exception of Kellner's results upon meadow hay, the figures of the above table are based upon one or two determinations only upon a single animal, and are therefore subject to correction in the light of future investigation. In other words, they are suggestive but not final.

On the other hand, however, it is believed that the distinctions which these figures show between the digestible nutrients, the fuel values, the maintenance values, and the production values, as well as the differences between different classes of feeding stuffs in these respects, are significant. In other words, it is believed that the differences are too great to be explained by experimental errors. When we find, for example, that on the basis of digestible nutrients 174 pounds of timothy hay are the equivalent of 100 pounds of corn meal, while the actual experiment on the animal shows that for maintenance 211 pounds and for fattening 273 pounds of timothy hay are required to equal 100 pounds of corn meal, we are dealing with differences too large to be accidental and too important to be ignored in the practical computation of rations.

Furthermore, these results show that the only safe basis for a comparison of the values of feeding stuffs is the actual experiment upon the animal, in which the real gain or loss of flesh and fat is accurately determined. In other words, the only way to ascertain the nutritive effect is to actually determine it.

Finally, the table by its brevity shows the need of further investigation. It contains, so far as the writer is aware, all the results available at present upon the relative maintenance values of feeding stuffs. A considerably larger number of experiments upon the production values have been made by Kellner upon mature fattening cattle, some of the results of which are described below. Practically no experiments of this character are available upon other species of animals or for other purposes of feeding. A partial exception to this is found in the investigations of Zuntz and Hagemann upon the horse; but even these, while yielding invaluable results upon the laws of work production by this animal, have, in the writer's judgment, largely a qualitative value as regards the relations between the food supply and the amount of work performed.

COMPUTED PRODUCTION VALUES.^a

As already noted, the most extensive investigations in this field are those of Kellner upon mature fattening cattle. Kellner first endeavored to determine the production values of pure nutrients, and

^a Compare Kellner: *Die Ernährung der landwirtschaftlichen Nutztiere*, pp. 153-163.

executed an extensive series of experiments with this object in view. His final results are as follows:

TABLE 10.—*Production values per pound.*

	Calories.
Digestible proteids	1, 016
Digestible starch or crude fiber	1, 071
Digestible cane sugar	812
Digestible fat in coarse fodders	2, 041
Digestible fat in grains and by-products	2, 273
Digestible fat in weeds with over 5 per cent fat	2, 585

As the next step in his investigations, Kellner determined by actual experiment the production values of a variety of typical feeding stuffs and compared them with those calculated from the digestible nutrients by the use of the above figures. In the case of fine concentrated feeding stuffs he found a very close agreement between the two. In the case of coarse fodders, on the contrary, his actual results were much lower than the computed ones. The difference was found to be very closely proportional to the amount of crude fiber present, amounting to 617 calories for each pound of total crude fiber. When this deduction was made the computed results agreed very closely with those actually found. Finally, for certain intermediate classes of feeds, such as milling by-products, chaff, roots, etc., he obtained results intermediate between those for fine concentrated feeds and for coarse fodders. On the basis of these results he has prepared a table showing, in addition to the digestible nutrients as ordinarily determined, the production values, either as actually found or as estimated in accordance with the above principles. The data for constructing such a table are confessedly somewhat scanty, but Kellner believes that it at least corresponds more nearly with the truth than the current method does.

At my request Mr. Winfred W. Braman, assistant in animal nutrition, has prepared the appended table, in which the production values of some of the more common American feeding stuffs are computed in accordance with Kellner's methods. The table is based upon those given in Farmers' Bulletin No. 22 (revised edition), of the United States Department of Agriculture. In the case of coarse fodders the deduction for the crude fiber has been made precisely as described above, but in other cases the production value has been computed from the amounts of digestible nutrients by the use of Kellner's factors and the total thus obtained multiplied by the percentage valuation given in his table.

In addition to being based upon American analyses and digestion experiments, the table also differs from Kellner's in expressing the production values in calories, while Kellner expresses them in terms of the equivalent number of pounds of starch.

These production values are doubtless a considerable advance over anything that we have had previously. At the same time, it should be remembered that they apply only to one species of animal and to a single purpose of feeding. It is altogether probable that for other purposes of feeding and for other species of animal not only the actual but the relative values would be materially different from those given in the table, while the differences which will be noticed between the computed figures of the table and some of our own results given in the foregoing pages emphasizes the need of further investigation.

TABLE 11.—*Production values per 100 pounds, computed according to Kellner.*

Feeding stuff.	Total dry matter.	Total crude fiber.	Digestible matter.			Production value.
			Proteids.	Carbo-hydrates.	Fat.	
Green fodder and silage:	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Calories.</i>
Alfalfa.....	28.20	7.40	2.50	11.20	0.41	10,806
Clover, red.....	29.20	8.10	2.21	14.82	.69	14,528
Corn fodder.....	20.70	5.00	.41	12.08	.37	11,024
Corn silage.....	25.60	5.80	.88	14.56	.88	14,260
Hungarian grass.....	28.90	9.20	1.38	15.63	.36	13,149
Rye.....	23.40	11.60	1.44	14.11	.44	10,316
Timothy.....	38.40	11.80	1.04	21.22	.64	17,809
Hay and dry coarse fodders:						
Alfalfa hay.....	91.60	25.00	6.98	37.38	1.38	34,413
Clover hay, red.....	84.70	24.80	5.41	38.15	1.81	34,748
Corn fodder, field cured.....	57.80	14.30	2.13	32.34	1.15	30,588
Corn stover.....	59.50	19.70	1.80	33.16	.57	26,536
Corn-pea hay.....	89.30	20.10	8.57	38.40	1.51	42,769
Hungarian hay.....	92.30	27.70	3.00	51.67	1.24	44,081
Oats hay.....	84.00	27.20	2.59	33.35	1.67	36,975
Soy-bean hay.....	88.70	22.30	7.68	38.72	1.54	38,656
Timothy hay.....	86.80	29.60	2.05	43.72	1.43	33,562
Straws:						
Oats.....	90.80	37.00	1.09	38.64	.76	21,213
Rye.....	92.90	38.90	.63	40.58	.38	20,876
Wheat.....	90.40	38.10	.87	36.30	.40	16,562
Roots, etc.:						
Carrots.....	11.40	1.30	.37	7.88	.22	7,829
Mangel-wurzels.....	9.10	.80	.14	5.65	.11	4,621
Potatoes.....	21.10	.60	.45	16.43	.....	18,054
Turnips.....	9.50	1.20	.22	6.46	.11	5,746
Grains:						
Barley.....	89.10	2.70	8.37	64.88	1.60	80,768
Corn.....	89.10	2.10	6.79	66.12	4.97	88,847
Corn and cob meal.....	84.90	6.60	4.68	60.06	2.94	72,051
Oats.....	89.00	9.50	8.36	48.34	4.18	66,279
Rye.....	88.40	1.70	8.12	69.73	1.86	81,721
Wheat.....	89.50	1.80	8.90	69.21	1.68	82,636
By-products:						
Brewers' grains, wet.....	24.30	3.80	3.81	9.37	1.38	14,827
Cotton-seed meal.....	91.80	5.60	35.15	16.52	12.58	84,206
Gluten feed, dry.....	91.90	6.40	19.95	54.22	5.35	79,422
Gluten meal, Buffalo.....	91.80	6.10	21.66	43.02	11.87	85,464
Gluten meal, Chicago.....	.....	.....	33.09	.....	.....	.....
Linseed meal—						
Old process.....	90.80	8.90	27.54	32.81	7.06	78,929
New process.....	90.10	8.80	29.26	38.72	2.90	74,677
Malt sprouts.....	89.80	10.70	12.38	43.50	1.16	46,337
Rye bran.....	88.20	3.30	11.85	52.40	1.79	56,659
Wheat bran.....	88.50	9.00	10.21	41.25	2.87	48,233

DESIGNS FOR DAIRY BUILDINGS.

By ED. H. WEBSTER.

Chief of the Dairy Division.

The great demand for information relating to the construction of dairy buildings led the Dairy Division of the Bureau of Animal Industry to start a line of investigation for the purpose of developing the basic principles of such construction. In order to make the work thoroughly practical, these studies were extended to the planning and actual supervision of construction of a number of dairy buildings in different sections of the country. The work is still in its formative stages and far from complete, but already promises valuable results in securing better methods of construction. In order to place the matter now available in form for wider distribution and usefulness, a number of plans are here presented, with brief descriptions. The designs are not intended to represent the only constructions advisable for the purposes indicated, but are intended to be suggestive of certain principles of construction which any architect or builder may use in designing a barn or other dairy building for a special location. No two locations will require or even permit of the same treatment so far as exposure, size, form, or building material are considered; but the problems of ventilation, cubic air space per cow, light, floors, ceilings, etc., are nearly alike in all cases. The designs shown represent feasible and inexpensive dairy buildings, planned by the Dairy Division and built in various sections of the country. Plans and specifications were furnished to builders, with the understanding that they would keep account of the cost of construction and furnish such other data as might be necessary for a complete description of the work.

A detailed description is given of one design only, but the principles are largely the same in all of the plans shown. This article will serve to illustrate the work done in this line during the year 1906.

STABLE FOR TWENTY-FOUR COWS.

The plan shown in figures 4 and 5 is designed for 24 cows, and allows ample room for calf pen and box stalls for bull and cows, also space for feed room, hay chute, wash room, and silo. The amount of space allowed for the various purposes will meet the usual requirements. The arrangement of the space can be adapted to the needs of the particular location.

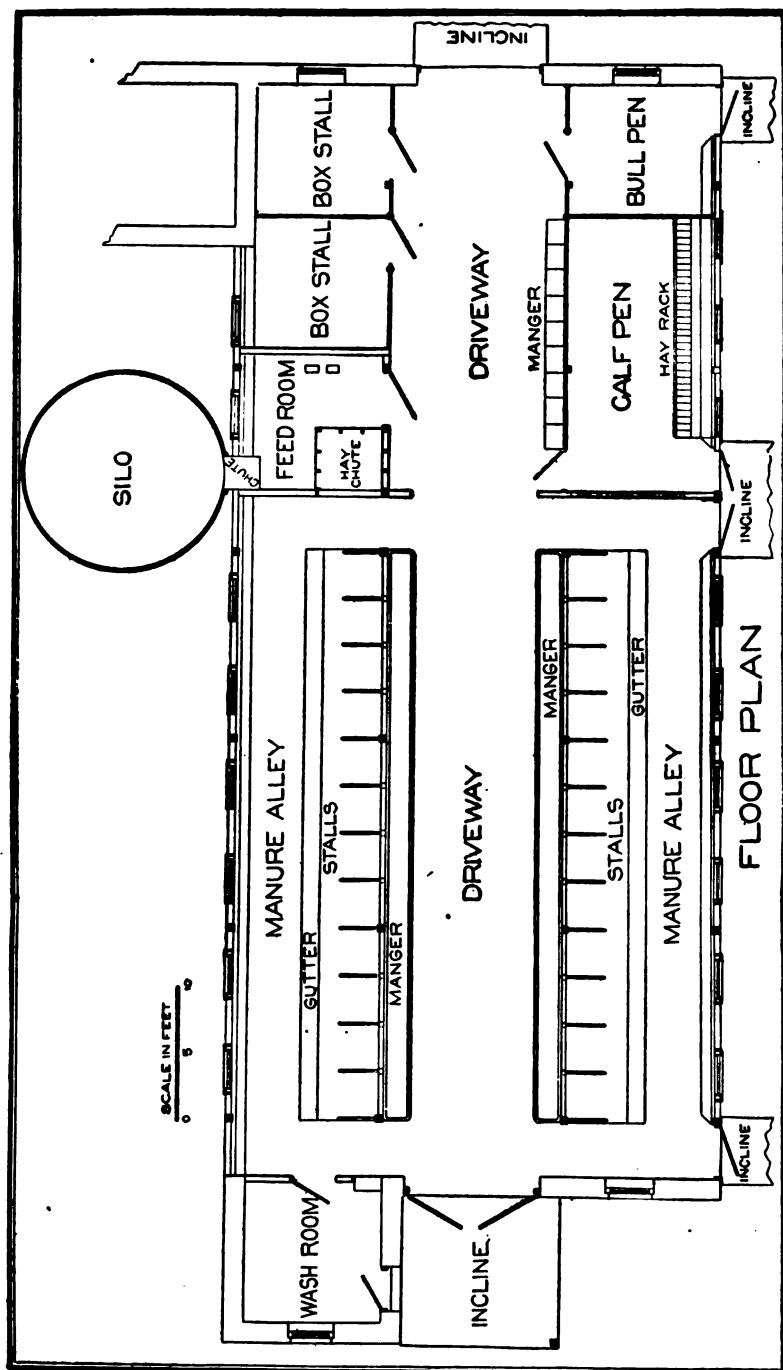


FIG. 4.—Floor plan of modern dairy barn for 24 cows.

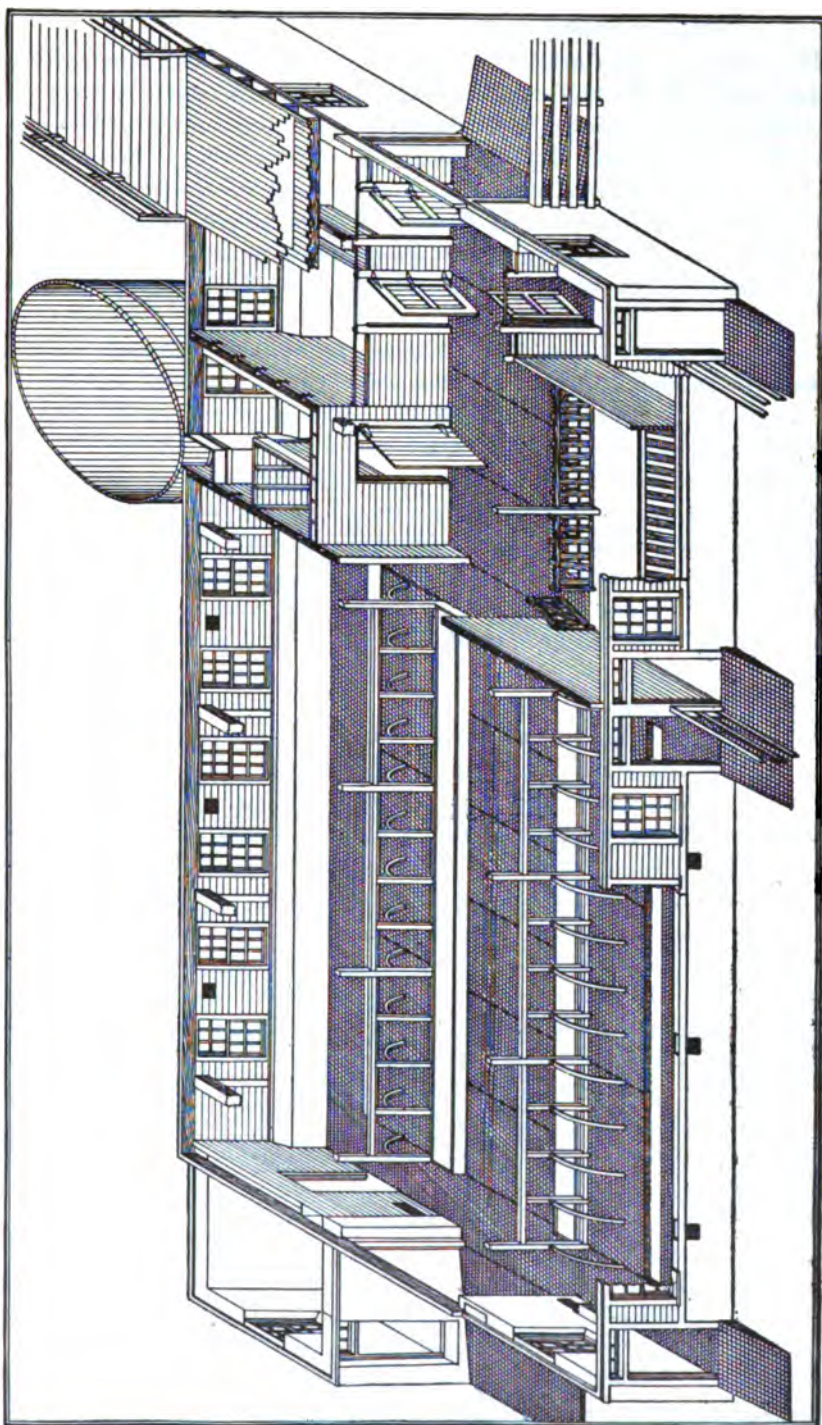


FIG. 5.—General view of interior of barn shown in fig. 4.

SPECIAL FEATURES COMMON TO ALL WELL-PLANNED BARN.

The width of this barn is 36 feet 4 inches outside. This allows ample room for the stalls and passageways, and permits of the most economical use of lumber in building. While the length here shown is 84 feet 9 inches, this depends on the number of cows to be handled. The side walls are built of stone or concrete up to the window sills, the balance of the walls being frame. The end walls are constructed of stone or concrete up to the ceiling. A partition extends across the barn so that the cow stable can be entirely shut off from the rest of the barn.

Posts and joists.—The posts carrying the upper floors are 6 by 6 inches, the girders 10 by 12, and the joists 2 by 12. If yellow pine is used, the joists should be spread 24 inches between centers, but if hemlock is used, the distance should be reduced to 16 inches.

Windows.—One of the weakest points in barn construction is the small amount of window space usually allowed. This plan provides approximately 6 square feet for each cow. It will be noted from the elevation that the windows are sliding sash extending to the ceiling, making them nearly twice as high as they are wide. This arrangement will admit much more light than the same space if the windows were placed otherwise.

Stalls.—The plan shows a width of stall of 3 feet 6 inches, which is as narrow as should be allowed. The depth is indicated as 4 feet 6 inches, but this may be varied according to the size of the cows in the herd. The manure gutter is 14 inches wide and 6 inches deep.

Manger.—The manger is planned to be 2 feet wide and 6 inches deep, with slightly rounded corners, the front sloping at an angle of 45 degrees and the bottom being 2 inches higher than the floor of the stalls.

Floor.—The entire floor is concrete, 6 inches in depth when finished, laid over at least 6 inches of cinders or broken rock. Concrete is considered the best material for a floor for several reasons: (1) It is the only material that is sanitary; (2) it is economical because of its durability; (3) when a reasonable amount of bedding is used it is comfortable to the animals and no bad effects result. The floor is intended to be raised about one foot above the level of the ground to insure drainage.

Alleys.—The alleys behind the cows are 4 feet wide. Manure should be taken away from the barn daily and deposited in a manure shed or on the field, and the alleys are designed with this in view. It is undesirable from the standpoint of construction and sanitation to have a manure pit under the stable.

Calf pen.—A comfortable calf pen should be provided, effectively separated from the milking herd. The one shown is 21 by 11 feet. Individual stanchions are provided for feeding calves grain and milk.

Bull pen and box stalls.—These are approximately 10 by 10 feet. There is a full window in each stall, providing an abundance of light.

Feed room.—This is centrally located; a chute from the silo enters it, also two grain chutes from the upper floor. A hay chute from the loft above deposits the hay in the feeding alley.

Wash room.—No dairy barn is complete without a wash room for the milkers and barn attendants, and lockers for their clothes. This room should also contain a small boiler for providing hot water and steam, as this is a necessary part of the equipment of a modern dairy barn. Milk scales, record sheets, milk stools, etc., may also be kept there when they are not in use.

Watering.—Watering devices may be put in the stable or provided for outside at the option of the builder.

Silo.—The silo planned for this barn is 14 feet in diameter and 32 feet high, and has a capacity of about 110 tons. This will provide silage for 24 animals for six to eight months.

Details of construction of stalls, stanchions, silos, etc., will be found later on, commencing with figure 19.

GENERAL VIEW OF INTERIOR OF BARN.

Figure 5 shows the construction of walls, floors, and partitions; also the location of doors and arrangement of stalls. The stalls are so designed that stanchions or chain ties may be used. Builders who desire to use patent stalls will find the arrangement of gutter, platform, and feed manger applicable to their use.

Storage of feed.—There is no objection to storage above the cow stable proper so long as the floor is similar in construction to the one in the drawing, so as to be kept perfectly tight.

Ceiling.—In colder climates it is deemed better to have a comparatively low ceiling on account of temperature, and this construction admits of changes in this respect.

Ventilation.—The plan adapts itself to any system of ventilation. The openings shown give a suggestion as to where the fresh air may be taken in and the impure air discharged.

Driveway to second floor.—This is located on one side of the barn, at the end. The main reason for locating the driveway at this point is because it does not shut out any light from the floor below.

SOUTHERN STABLE FOR TWENTY COWS.

Figures 6, 7, and 8 show a design prepared especially for southern conditions. The entire side walls are arranged in panels or doors, so that if desired the stable can be converted into an open shed. With ordinary construction of side walls, this plan is suited to any

climate. The lower chords of its scissors truss are used as ceiling joists on which smooth sheathing is laid, making a sanitary ceiling.

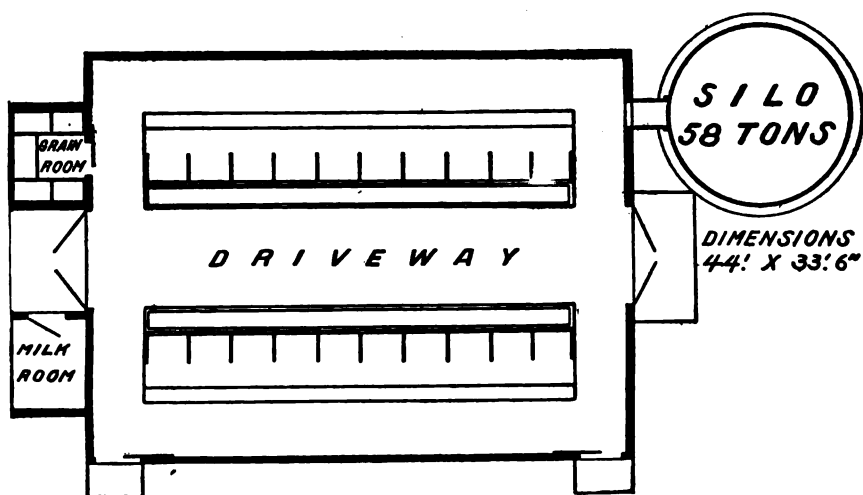


FIG. 6.—Floor plan of southern stable for 20 cows.

TWO-STORY STABLE FOR ONE HUNDRED COWS.

Figure 9 shows the floor plan and figure 10 the cross section of a two-story stable for 100 cows. Figure 10 also shows details of the



FIG. 7.—Front elevation of barn shown in fig. 6.

provisions for extra ventilation by pivoted slats over the windows (A). These drawings also indicate the alternate arrangement of

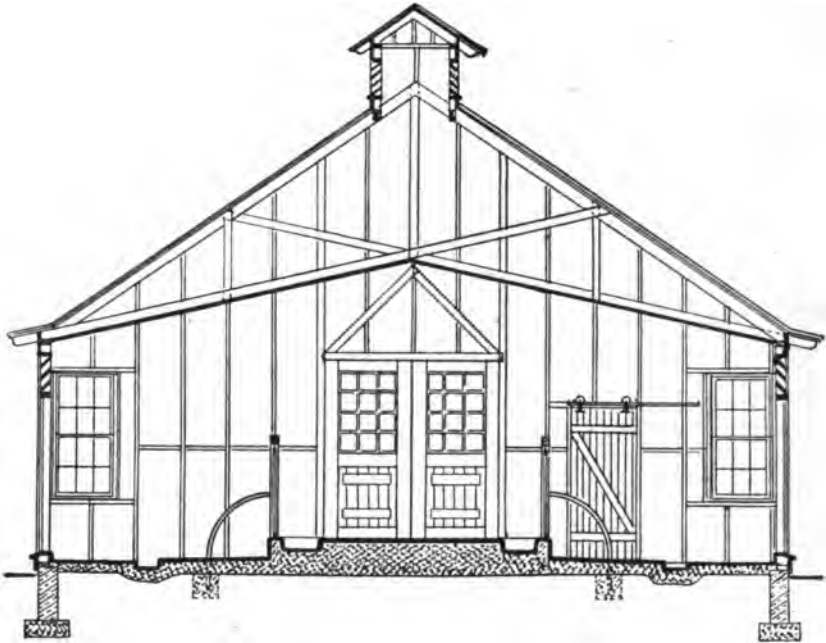


FIG. 8.—Cross section of barn shown in fig. 6, looking toward front.

stalls, the left side showing feeding alley in the center of the stable and the right side showing the manure alley in the center. Provision

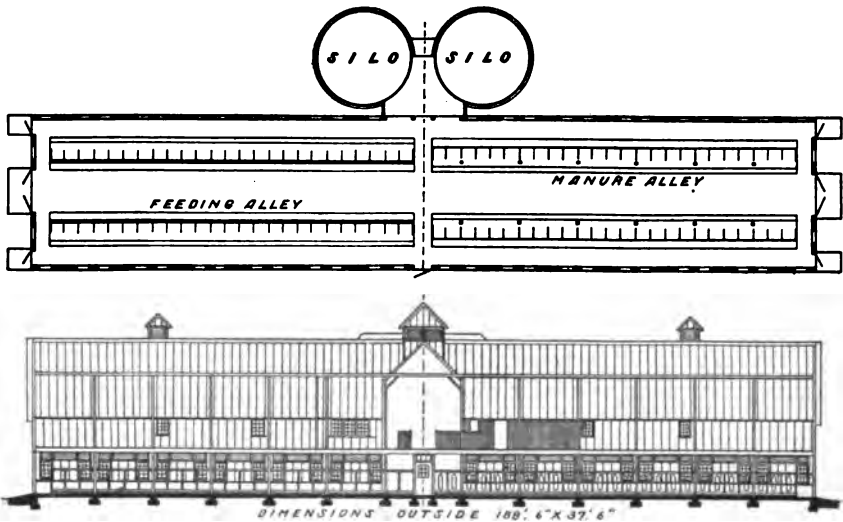


FIG. 9.—Floor plan and longitudinal section of two-story stable for 100 cows.

is made for storage of hay and grain over the stable, with tight floor and ceiling for perfect separation. The King system of ventila-

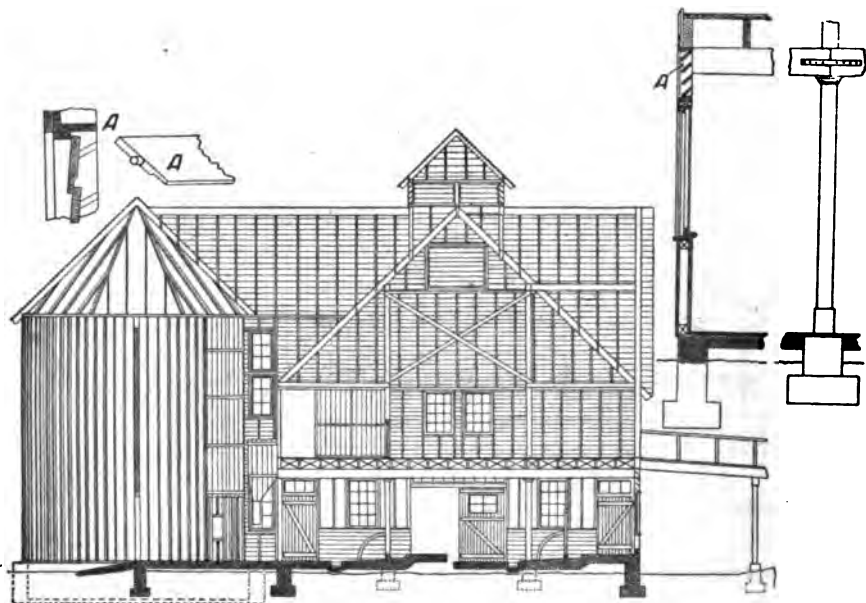


FIG. 10.—Cross section showing details of construction of stable shown in fig. 9.

tion can be installed in this design instead of the system shown, provided the walls are made sufficiently tight. Entrance to the second

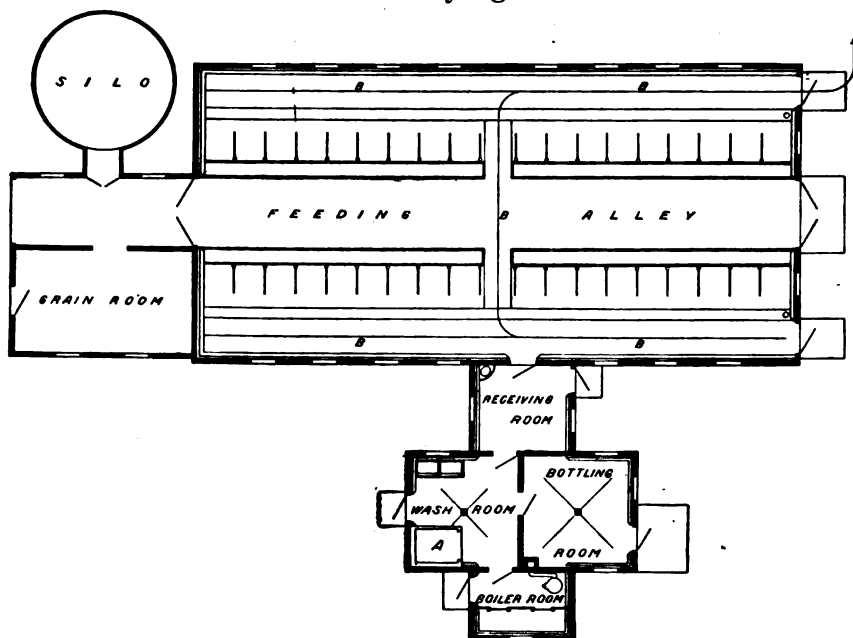


FIG. 11.—Floor plan of stable for 36 cows, with semidetached milk house.

floor is by a central driveway over a bridge, avoiding any banking against the walls of the barn.

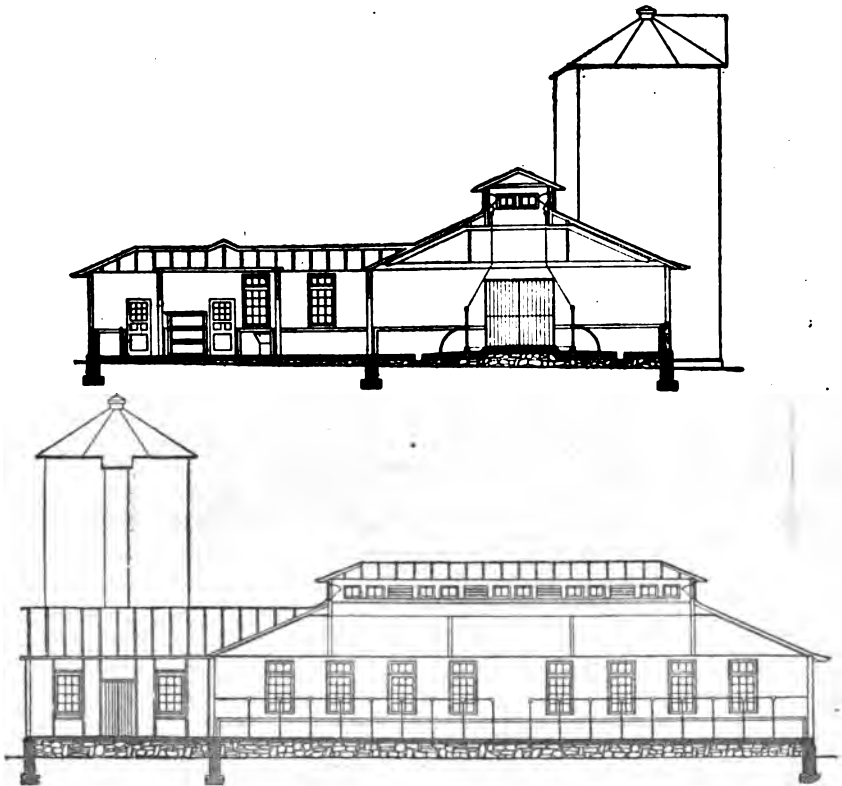


FIG. 12.—Cross sections of stable shown in fig. 11.

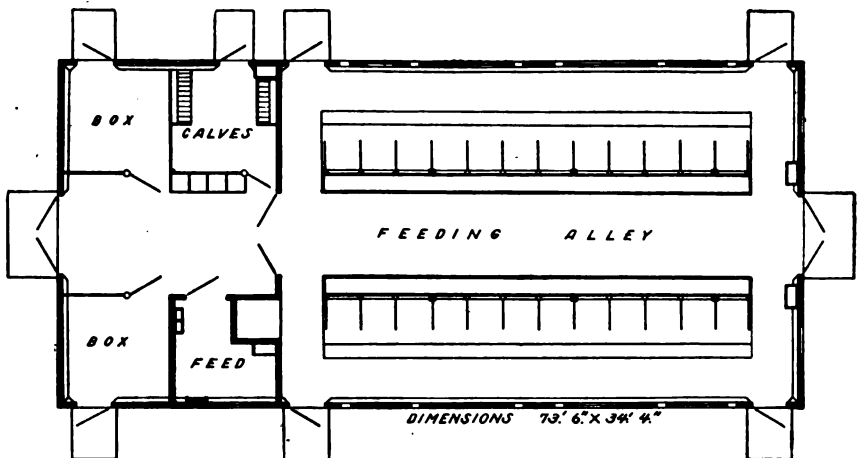


FIG. 13.—Floor plan of two-story stable for 24 cows.

STABLE WITH MILK HOUSE FOR THIRTY-SIX COWS.

Figures 11 and 12 show a design for a stable, with semidetached milk house, for 36 cows. In the floor plan (fig. 11) *A* is the steril-

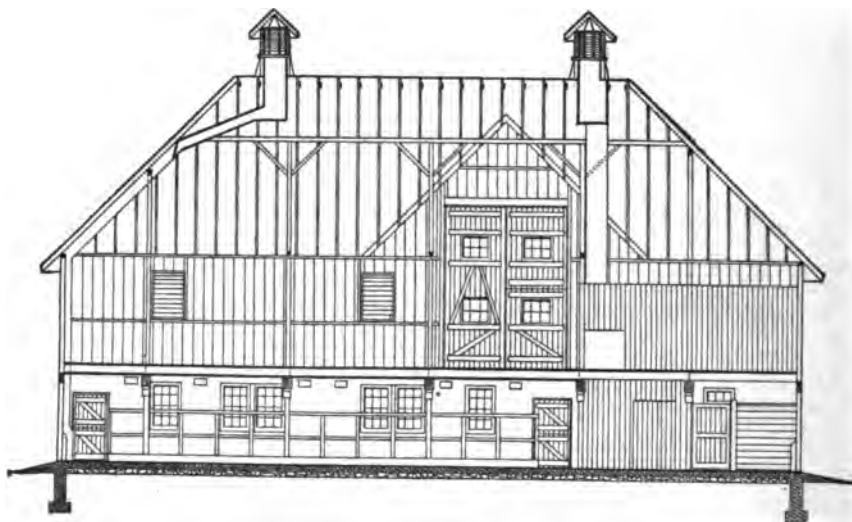


FIG. 14.—Longitudinal section of stable shown in fig. 13, showing system of ventilation.

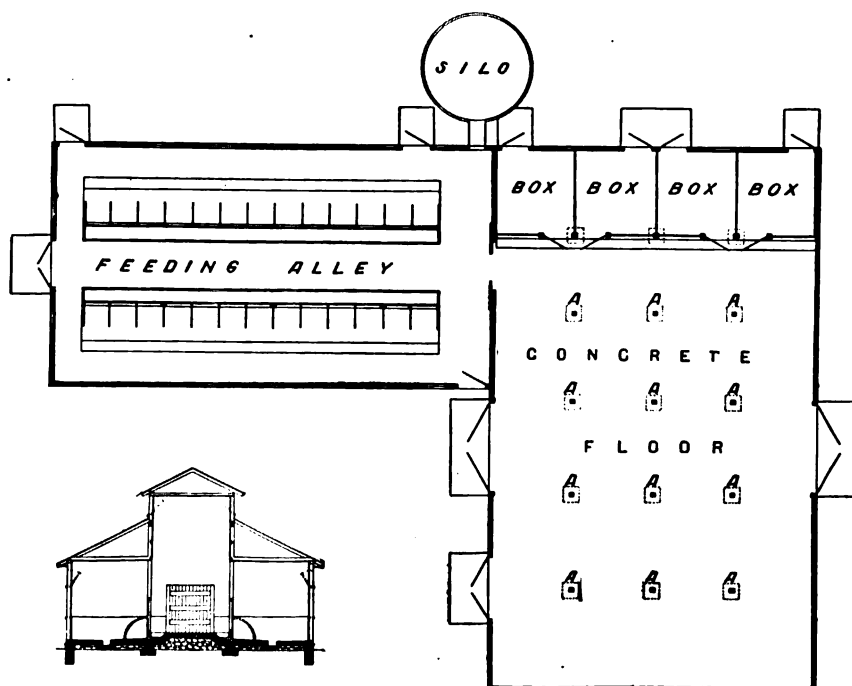


FIG. 15.—Floor plan and cross section of stable for 26 cows, showing box stalls, silo, and space for wagons and farm machinery.

izer and *B* is the overhead track for manure carrier. In the cross section (fig. 12), upper drawing, cords are shown by which the ventilating windows in the roof are controlled. It is expected that only cows in milk will be kept in this stable.



FIG. 16.—Longitudinal section of stable shown in fig. 15.

TWO-STORY STABLE FOR TWENTY-FOUR COWS.

Figure 13, floor plan, and figure 14, longitudinal section, show a design for a complete stable for 24 cows, with room for calves, feed, and forage. The construction is of the post-and-girt system. Ventilation is provided by the King system, two exhaust flues starting from each end of the stable near the floor and six inlets admitting air near the ceiling on each side.

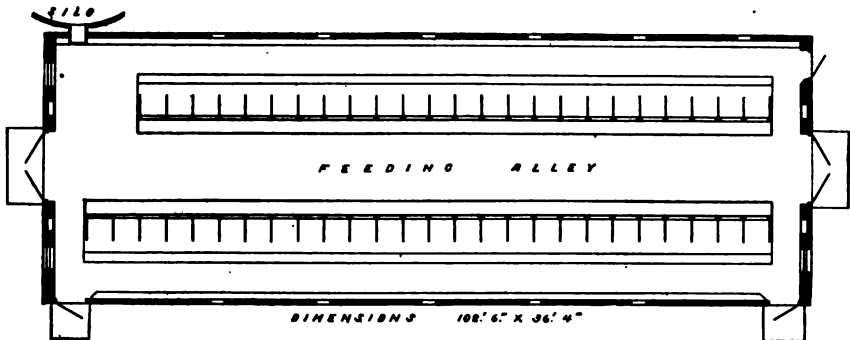


FIG. 17.—Floor plan of two-story stable for 50 cows.

COMBINATION BARN FOR TWENTY-SIX COWS.

Figure 15, floor plan and cross section, and figure 16, longitudinal section, show a design providing for 26 cows in the one-story wing, four box stalls for horses and space for wagons and implements on the ground floor of the main building, with storage for fodder and grain on the second floor. Ventilation is provided for by hinged windows under the eaves and in the clearstory. *A* shows the footings for posts for upper story.

TWO-STORY STABLE FOR FIFTY COWS.

Figure 17, floor plan, and figure 18, end elevation and detail of construction, show a design for the accommodation of 50 cows in a very

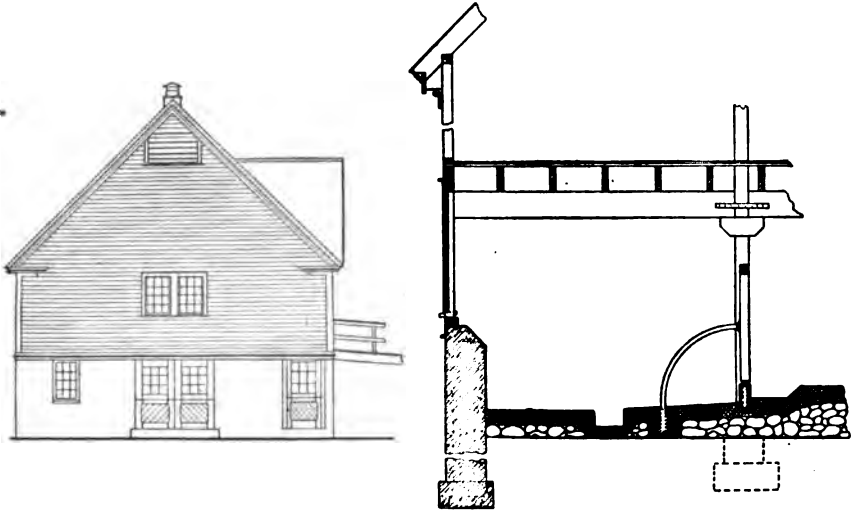


FIG. 18.—End elevation and detail of construction of stable shown in fig. 17.

simple arrangement for a strictly dairy herd, with storage on the second floor. The driveway to the second floor is at the center of the side under a cross gable and over a bridge from detached wall.

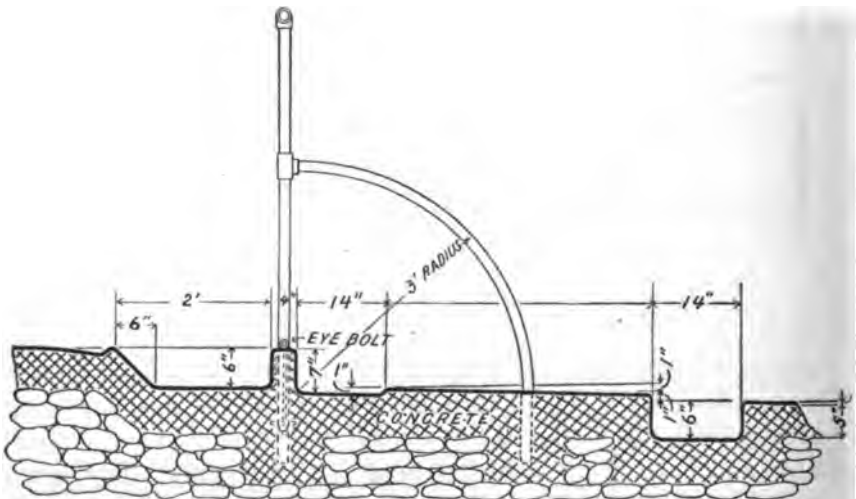


FIG. 19.—Sanitary stall construction with iron-pipe fittings and chain-hanging stanchions.

CONSTRUCTION OF STALLS AND STANCHIONS.

Figure 19 shows detail of sanitary stall construction with iron-pipe fittings and chain-hanging stanchions. The dimensions are adapted

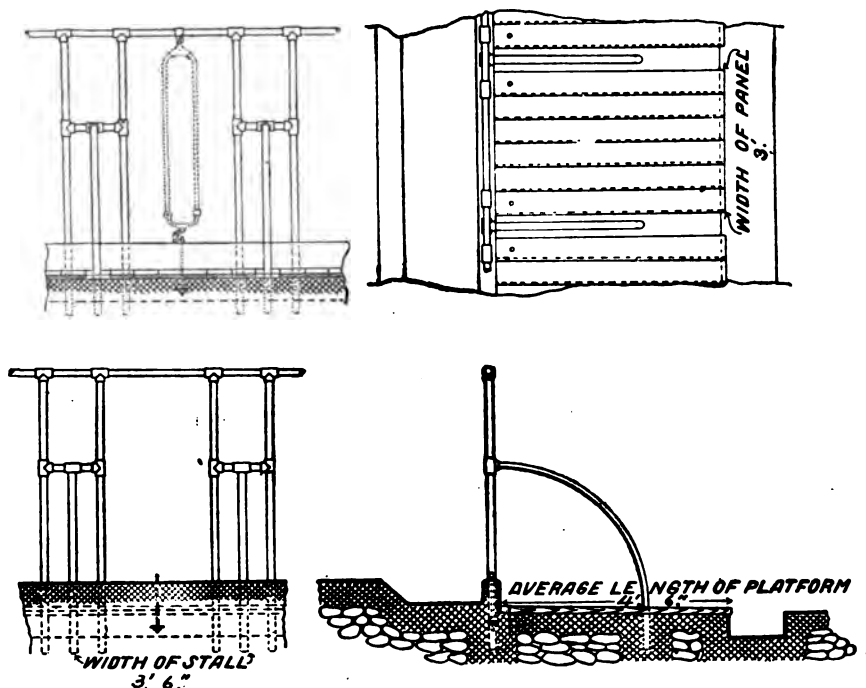


FIG. 20.—Stall with movable wooden floor and fastening for same.

to cows of average size. The depression of 1 inch in the front part of the platform enables the cow to stand level, helps to prevent her from slipping on the cement, and also helps to retain bedding in place.

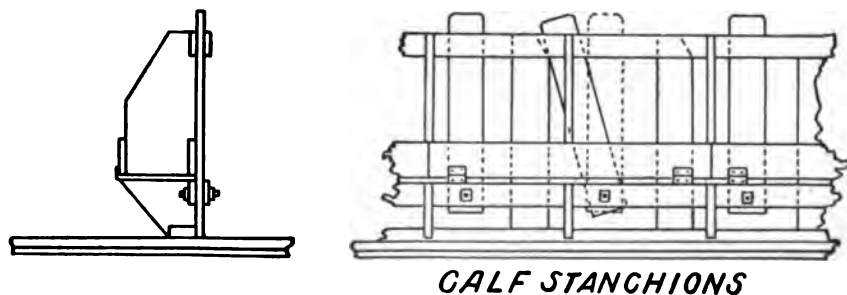


FIG. 21.—Simple and economical calf stanchions.

Figure 20 shows a similar stall provided with a movable wooden floor. The advantage of this design will be appreciated by those who find the cement too cold for the comfort of the cows during the northern winters. The wooden platform is kept in place by two iron pins set in the cement floor near the front corners of the stall. The floor panel is easily removed for cleaning.

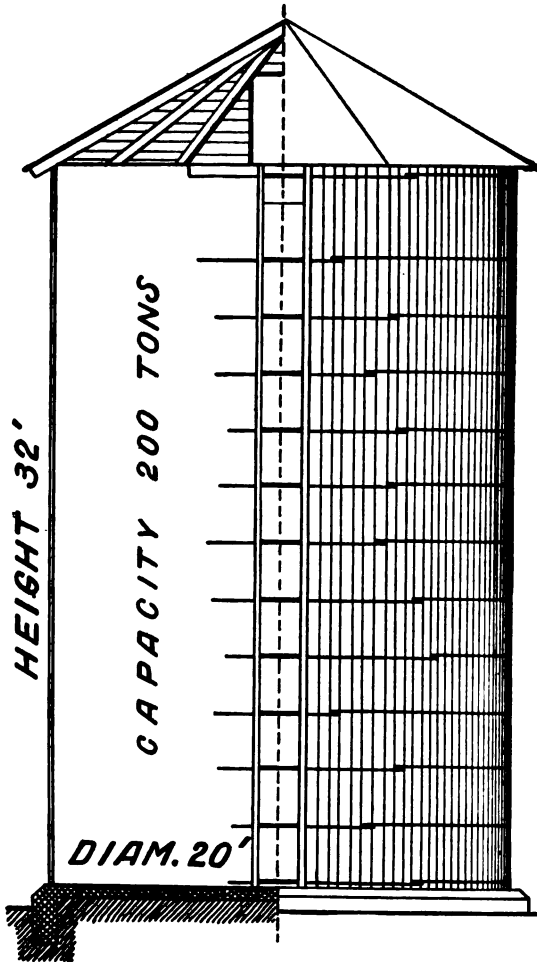


FIG. 22.—A 200-ton stave silo with continuous doors.

Figure 21 shows simple and economical calf stanchions which have been found convenient and satisfactory for feeding milk in pails and for feeding grain as well. The hinged front makes cleaning simple. The calves are to be confined only while feeding, being allowed the freedom of their boxes or pens at other times.

STAVE SILOS.

Figure 22 shows a 200-ton silo with continuous doors. The foundation wall is laid up from below frost line, and the cement floor covers the area within the foundation wall. The door posts are held in position by sections of iron pipe through which pass iron bolts.

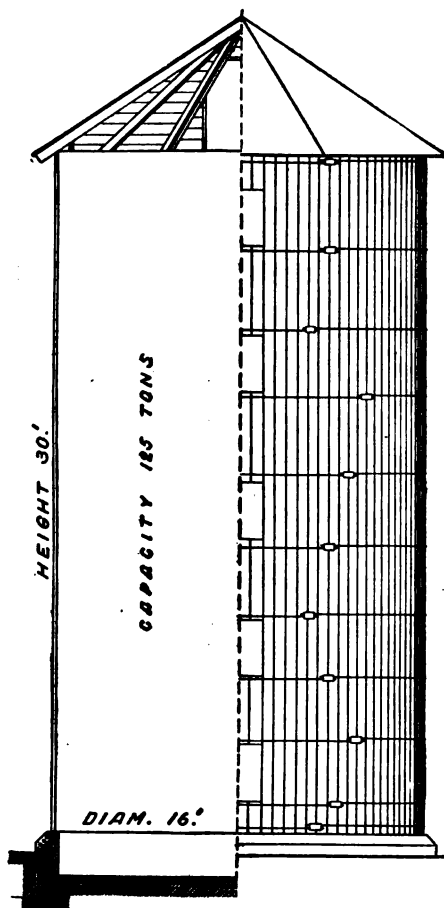


FIG. 23.—A 125-ton stave silo without continuous doors.

Figure 23 shows a stave silo of 125-ton capacity without continuous doors. The foundation wall should be reinforced by iron hoops or wire embedded in the concrete near the top if the wall extends more than 1 foot above the ground. In the erection of these silos the staves are spiked together at intervals of about 5 feet. A half-inch hole is bored to a depth of about 1 inch if staves are 2 by 4 inches, and to a

depth of 3 inches in staves 2 by 6 inches, to allow the countersinking of the nail heads so as to keep them within the stave after the usual shrinkage and to give the nail sufficient hold. This method avoids the expense of tonguing and grooving the staves and holds the silo firmly together when empty and dry.

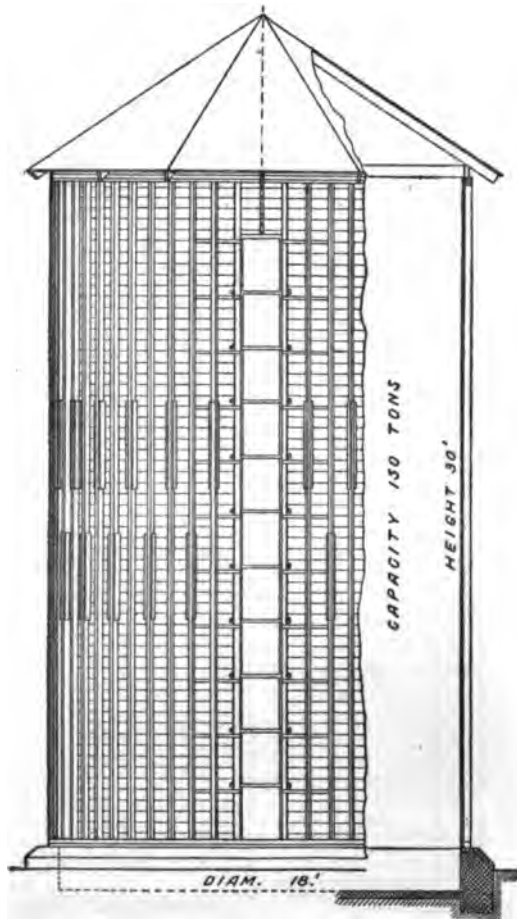


FIG. 24.—A 150-ton modified Wisconsin silo.

MODIFIED WISCONSIN SILO.

Figure 24 shows a modified Wisconsin silo of 150-ton capacity. The foundation wall rises from 2 feet below grade, or below frost line, to 1 foot above grade. Continuous doors are provided, as in figure 19.

SILO WITH WOODEN HOOPS.

Figure 25 shows a 75-ton silo with wooden hoops. Four thicknesses of tough $\frac{1}{2}$ -inch lumber are used in building up the three or four hoops nearest the bottom, and three thicknesses for the rest of the hoops. The lining is of $\frac{3}{4}$ -inch matched lumber. The construction of doors is shown at the side of this figure. *A, A, A* are iron clips bolted to the door; *B, B* are the door posts; *C* is the wooden hoop.

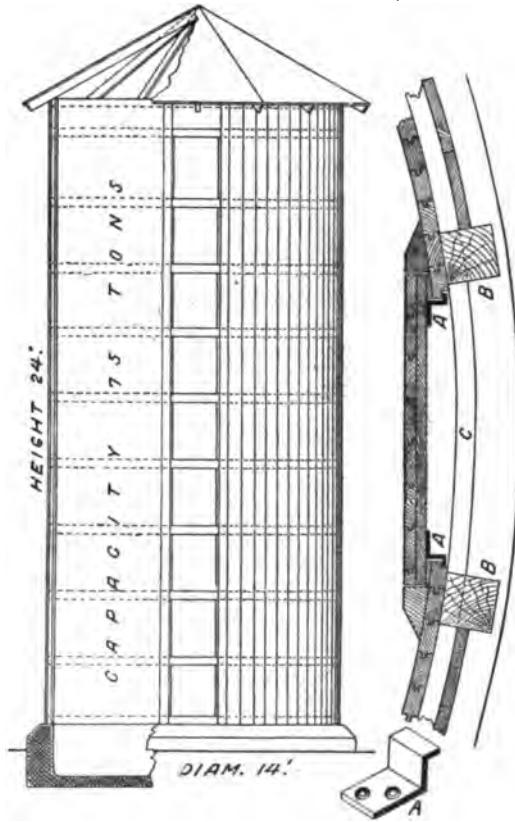


FIG. 25.—A 75-ton silo with wooden hoops.

DETAILS OF SILO CONSTRUCTION.

Figure 26 shows details of construction for the modified Wisconsin silo. *A* is the foundation; *B*, roof construction; *C*, arrangement for laying concrete in foundation; *D*, detail of doors. In figure 27, *A* shows how doors are cut from the staves when not made continuous; *B* shows general arrangement of continuous doors for stave silo.

DAIRY HOUSES.

Figure 28 shows a dairy house 10 by 12 feet, suitable for a dairy of about 20 cows. *A* is the drip board; *B*, *B*, wash trays; *C*, water heater; *D*, cooling tank; *E*, platform for receiving and delivering milk.

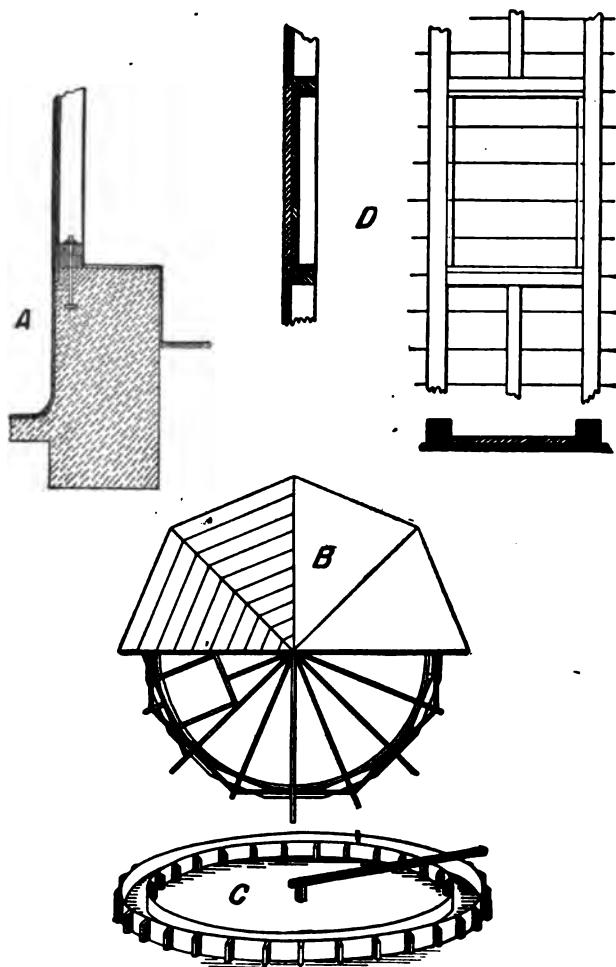


FIG. 26.—Details of construction of modified Wisconsin silo shown in fig. 24.

Figure 29 shows a dairy house for a small certified-milk plant. *A*, *A* are coal bunkers; *B*, boiler; *C*, sterilizer; *D*, shower bath; *E*, bottling table; *F*, cooler; *G*, receiving can.

Figure 30 shows a small dairy house suitable for the general needs of a herd of 25 to 30 cows. *A* is the ice box; *B*, butter worker; *C*, heater; *D*, churn; *E*, cream vat; *F*, trap to sewer; *G*, cooler; *H*, separator; *I*, can and pail rack. If this house is built of wood the brick chimney should be built outside the frame.

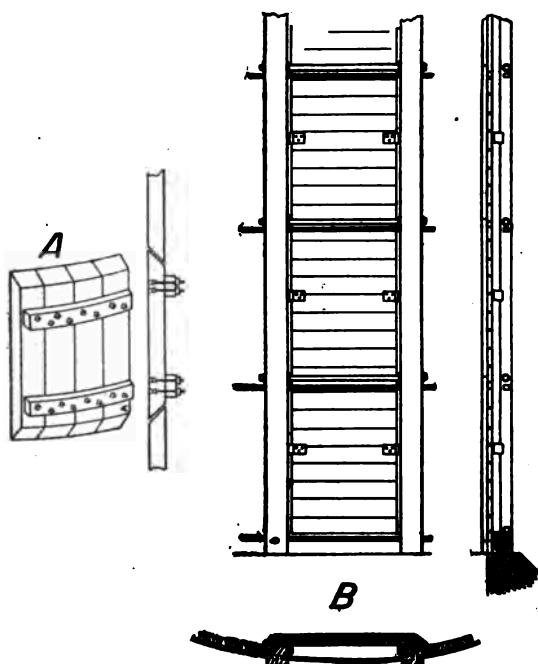


FIG. 27.—Details showing construction of doors of silo when not made continuous.

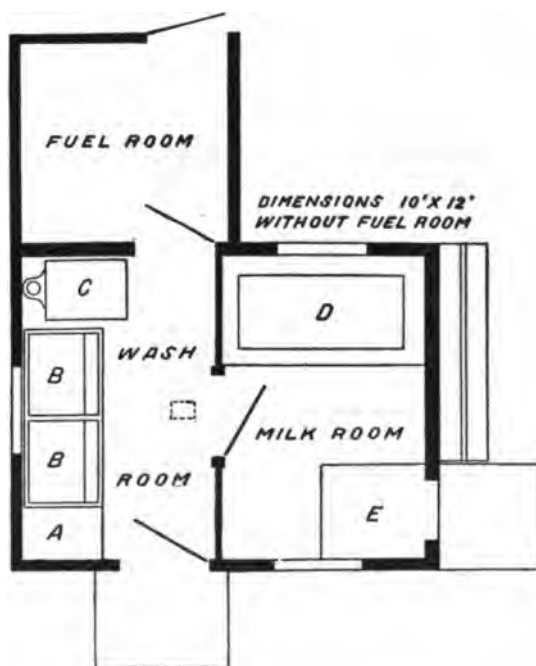


FIG. 28.—Floor plan of small dairy house suitable for dairy of 20 cows.

ICE HOUSE AND MILK ROOM.

Figure 31, floor plan, and figure 32, longitudinal section, show an inexpensive ice house with convenient milk room, in which the water draining from the ice chamber flows into a cooling tank.

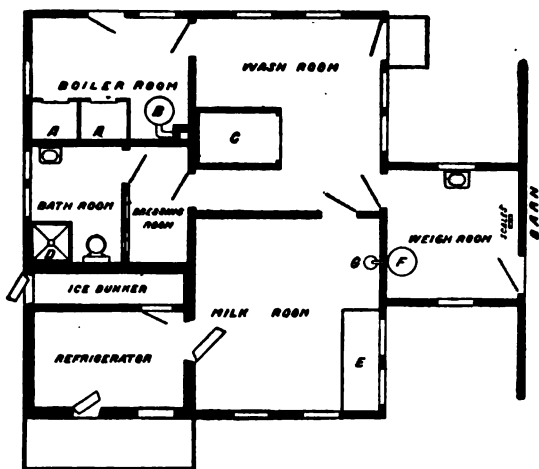


FIG. 29.—Floor plan of small plant for certified milk.

CREAMERY FOR WHOLE MILK.

Figure 33 shows the floor plan of a creamery for the use of whole milk. This design can be adapted to the farm separator system by

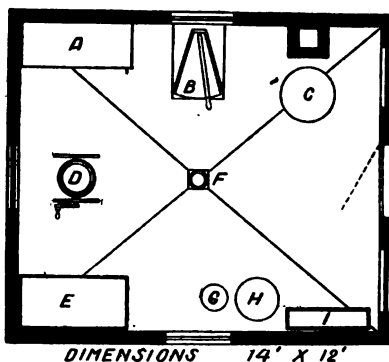


FIG. 30.—Floor plan showing arrangement of equipment in small dairy house suitable for dairy of 30 cows.

the omission of the separator and the substitution of a cream vat for the milk vat shown in the plan. For use in a northern climate the refrigerating machine could also be omitted and ice used for cooling.

In the plan as shown *A* is the pump; *B*, boiler; *C*, ice machine; *D*, engine; *E*, skim-milk weigher; *F*, churn; *G*, sink; *H*, milk vat; *I*, weighing tank; *K*, separator; *L*, cream vat; *M*, table.

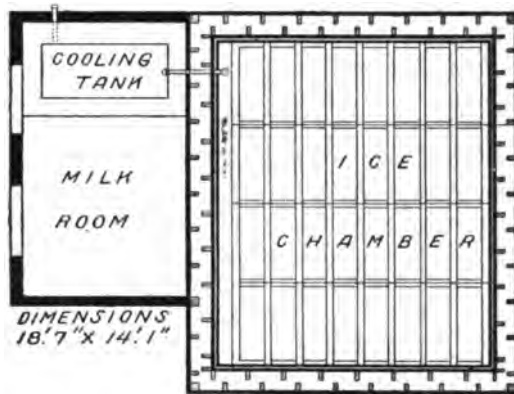


FIG. 31.—Floor plan of small ice house and milk room.

CREAMERY FOR CITY MILK COMBINATION SERVICE.

Figure 34, floor plan, and figure 35, front elevation, show a building designed to accommodate a combination of creamery and city milk serv-

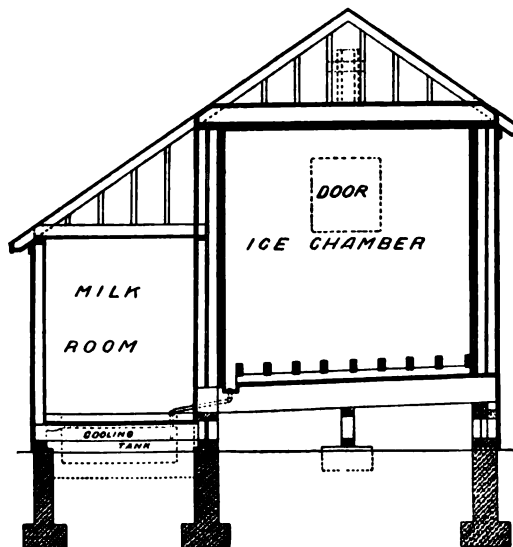


FIG. 32.—Cross section of ice house and milk room shown in fig. 31.

ice, with modern equipment for the best practice. The comparatively low chimney is sufficient for the gas engine to be used in this case.

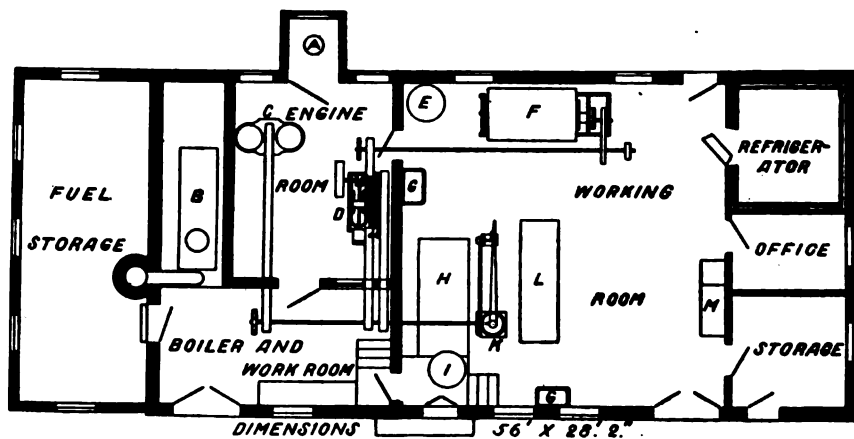


FIG. 33.—Floor plan of creamery for whole milk.

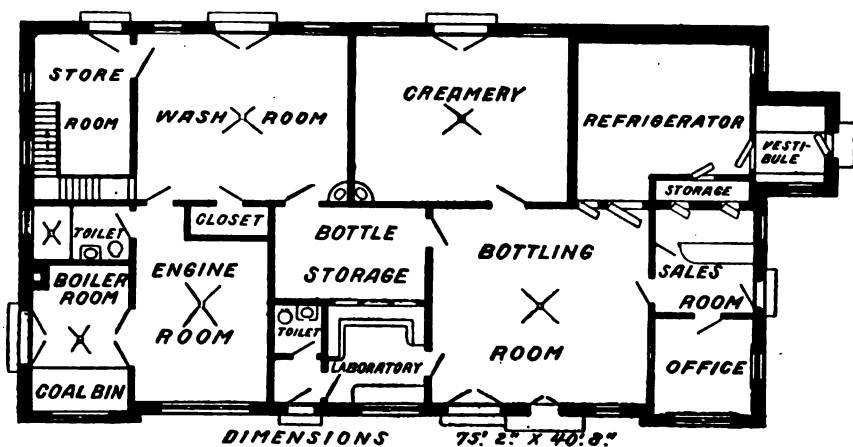


FIG. 34.—Floor plan of creamery and city milk plant.



FIG. 35.—Front elevation of creamery and city milk plant shown in fig. 34.

MISCELLANEOUS INFORMATION CONCERNING THE LIVE-STOCK INDUSTRY IN 1906.

The live-stock industry of the United States was in a remarkably flourishing condition during the greater part of 1906; never before in its history were such high prices obtained for all classes of farm animals nor such a high average reached for the year, with the single exception of 1902, the meat-famine year. For a short portion of the year, however, the meat trade was in a precarious condition, owing to the so-called packing-house disclosures, which precipitated a violent prejudice among the people against meat products as a whole and certain grades and kinds in particular. But the public soon learned to discriminate between canned meats, sausage, etc., which were most affected by the insanitary conditions at packing houses, and fresh meat, the wholesomeness of which was never seriously called into question. The result was a greater demand than ever for the better grades of meat, and consequently prices were obtained which were highly remunerative to the producer.

It will be seen from the table of market prices of live stock at Chicago (page 311) that the average price of native cattle for 1906 was \$5.60 per hundredweight, as against \$5.05 in 1905. This is an increase of 55 cents on each 100 pounds of live weight, or 11 per cent. Texas cattle rose on the average from \$4.20 to \$4.45, and western cattle made the highest gain of any, their average going from \$3.80 to \$4.40. Hog raisers had a phenomenally successful year. The hogs sold at Chicago alone during the year, according to a good market authority, realized \$15,000,000 more to the raisers than was received in 1905, and the average price on the market was an even \$1 per hundredweight more than in 1905, an increase of 19 per cent. Sheep raisers had a good year also, although their increases were not as great as the preceding.

The export trade in animal products for 1906 reached the highest aggregate yet attained in any year, the total value having been \$296,527,588, an advance of \$23,144,694 over 1905. The records show that prior to this the highest total value of animal products exported in one year had been \$286,826,152, in 1901. The agitation previously

mentioned seriously affected the exports of canned meats, but the falling off in this branch was more than offset by the great gains in the other classes of meats.

The prosperous condition and the vastness of the live-stock industry are well shown by the annual estimate of the number and value of farm animals on farms and ranges January 1, 1907, by the Bureau of Statistics of this Department, as follows:

Farm animals.	Number.	Percent compared with January 1, 1906.	Average price per head.	Value.
Horses.....	19,747,000	100.9	\$98.51	\$1,846,578,000
Mules.....	3,817,000	102.5	112.16	428,064,000
Milch cows.....	20,968,000	102.4	81.00	645,497,000
Other cattle.....	51,566,000	98.0	17.10	881,557,000
Sheep.....	58,240,000	103.0	8.84	204,210,000
Swine.....	54,794,000	99.5	7.62	417,791,000

The total value reaches the stupendous sum of \$4,423,697,000. The above statement shows an increase during 1906 in the number of all classes of animals except "other cattle" and swine, and the decrease in swine was insignificant. A striking enhancement in the value of farm animals during the year is shown by comparing the average prices per head as estimated on January 1, 1906, and on January 1, 1907. The increase in each class is as follows: Horses, \$12.79; mules, \$13.85; milch cows, \$1.56; other cattle, \$1.25; sheep, \$0.30; swine, \$1.44.

MARKET PRICES OF LIVE STOCK.

On the following pages are shown the prices of the various classes of farm live stock at two of the principal markets, Chicago and Omaha. These figures, excepting the first table, are compiled from official reports of the stockyard companies at those cities. The average prices are given whenever possible, but unfortunately in most cases only the high and low range of prices could be obtained. It will be understood, of course, that the mean between the highest and lowest prices does not necessarily give the true average.

Average prices, per hundredweight, of live stock at Chicago in 1906, by months, and annual average, 1894-1906.

[From the Weekly Live Stock Report.]

Month.	Cattle.			Hogs.	Sheep.	Native lambs.
	Natives.	Texans.	Westerns.			
January.....	\$5.40			\$5.40	\$5.35	\$7.25
February.....	5.40	\$4.45		6.00	5.00	6.30
March.....	5.50			6.30	5.20	6.40
April.....	5.85	4.55		6.55	5.85	6.20
May.....	5.40			6.45	5.45	6.40
June.....	5.85	4.60		6.55	5.30	6.70
July.....	5.60	4.85	\$4.40	6.65	5.15	6.60
August.....	5.75	3.65	4.40	6.25	4.90	7.00
September.....	5.75		4.30	6.25	5.10	7.00
October.....	5.90		4.45	6.40	4.80	6.90
November.....	5.85	4.60	4.50	6.20	5.00	7.00
December.....	5.80		4.40	6.25	5.00	7.15
Annual average:						
1906.....	5.60	4.45	4.40	6.25	5.15	6.80
1905.....	5.05	4.20	3.80	5.25	5.00	6.75
1904.....	5.10	4.10	3.65	5.15	4.10	5.45
1903.....	4.80	3.95	3.65	6.00	3.85	5.40
1902.....	6.75	4.80	4.95	6.85	4.05	5.45
1901.....	5.25	4.20	4.55	5.85	3.80	4.80
1900.....	5.15	4.20	4.35	5.05	4.55	5.90
1899.....	5.30	4.35	4.60	4.05	4.35	5.50
1898.....	4.65	4.05	4.20	3.85	4.25	5.35
1897.....	4.50	3.75	3.90	3.70	3.85	4.95
1896.....	4.05	3.35	3.50	3.50	3.20	4.50
1895.....	4.50	3.65	3.75	4.30	3.30	4.55
1894.....	4.25	3.20	3.60	5.05	2.80	4.35

Range of prices, per hundredweight, of cattle at Chicago and Omaha in 1906, by months, and annual range at Chicago, 1892-1906.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Native steers (1,500-1,800 pounds).	Native steers (1,200-1,500 pounds).	Poor to best cows and heifers.	Native steck- ers and feed- ers.	Texas and western steers.
January.....	\$4.75- \$6.50	\$3.90- \$6.40	\$2.60- \$5.40	\$2.00- \$4.60	\$4.00- \$4.50
February.....	5.00- 6.40	4.00- 6.35	2.60- 5.35	2.10- 4.80	4.25- 4.60
March.....	4.90- 6.35	4.25- 6.35	2.75- 5.60	2.25- 4.85	4.10- 4.60
April.....	5.00- 6.85	4.10- 6.20	2.80- 5.40	2.35- 4.90	3.90- 4.70
May.....	4.85- 6.20	4.25- 6.10	2.75- 5.40	2.50- 5.10	3.75- 4.60
June.....	5.10- 6.10	4.20- 6.10	2.40- 5.45	1.75- 4.80	3.35- 4.90
July.....	5.50- 6.50	4.30- 6.50	2.40- 5.55	2.00- 4.45	3.25- 4.65
August.....	5.50- 6.85	4.10- 6.75	2.40- 5.50	2.00- 4.60	3.10- 5.75
September.....	5.45- 6.95	4.00- 6.80	2.55- 5.75	2.05- 4.80	3.00- 5.80
October.....	5.45- 6.95	4.00- 6.80	2.60- 5.50	2.00- 4.55	2.90- 6.25
November.....	5.85- 7.40	4.20- 7.40	2.60- 5.85	1.75- 4.55	3.25- 6.35
December.....	5.25-10.50	4.25-17.00	2.55- 6.80	1.75- 4.65	3.40- 5.40
Annual range:					
1906.....	4.75-10.50	3.90-17.00	2.40- 6.60	1.75- 5.10	2.90- 6.85
1905.....	4.40- 8.65	3.00- 8.45	2.25- 6.80	1.50- 5.45	2.60- 5.25
1904.....	4.35-10.50	3.35-12.25	2.00- 7.50	1.50- 5.50	2.40- 6.65
1903.....	4.10- 7.55	3.35- 8.35	2.50- 5.50	1.50- 5.20	2.55- 5.10
1902.....	4.25-14.50	3.60- 9.00	3.35- 8.25	1.90- 6.00	2.55- 7.65
1901.....	4.75- 9.30	3.60- 12.00	2.00- 8.00	1.65- 5.15	2.75- 5.75
1900.....	4.70-15.50	3.90- 11.00	1.75- 6.00	2.10- 5.25	3.00- 5.90
1899.....	4.60- 8.50	4.00- 8.25	2.00- 6.85	2.50- 5.40	3.10- 6.75
1898.....	4.10- 6.25	3.80- 6.15	2.00- 5.40	2.50- 5.40	3.15- 5.40
1897.....	4.00- 6.00	3.35- 6.00	1.75- 5.40	2.40- 4.75	2.75- 4.90
1896.....	3.40- 6.50	2.90- 6.25	1.75- 4.40	2.20- 4.10	2.10- 5.50
1895.....	4.60- 6.60	2.90- 6.40	2.00- 5.75	2.25- 5.15	2.25- 5.75
1894.....	3.00- 6.60	2.90- 6.00	1.75- 4.40	2.00- 4.15	2.50- 5.00
1893.....	4.00- 6.75	2.90- 6.50	2.00- 5.00	2.25- 4.90	3.50- 6.00
1892.....	3.75- 7.00	2.85- 6.35	1.85- 4.00	2.00- 4.10	1.50- 5.25

* International show cattle.

† This price, \$17 per 100 pounds, was paid for the grand-champion load of 2-year-old Angus, averaging 1,438 pounds.

‡ \$10.50 represents the price paid for the grand-champion load of the international of 1904.

§ \$12.25 represents the price paid for the champion load of Angus yearlings at the international of 1904.

¶ The top price, \$8.35, was attained by one load of yearling Hereford steers, averaging 1,099 pounds.

• One load of Aberdeen-Angus steers, averaging 1,510 pounds, sold at \$14.50.

• Fifteen Aberdeen-Angus steers, averaging 1,492 pounds, sold at \$15.50.

Range of prices, per hundredweight, of cattle at Chicago and Omaha in 1906, by months, etc.—Continued.

OMAHA.

Month.	Native beeves.	Native cows.	Stockers and feeders.	Western steers.	Western cows.
January	\$3. 10-55. 50	\$1. 90-54. 10	\$2. 75-54. 35	\$3. 00-54. 30	\$2. 25-53. 50
February	3. 00-55. 60	1. 75-4. 50	2. 75-4. 75	3. 00-4. 75	2. 50-3. 40
March	3. 10-55. 60	2. 35-4. 75	3. 00-4. 70	3. 50-5. 00	2. 50-3. 80
April	3. 35-55. 60	2. 25-4. 70	2. 60-4. 80	3. 50-4. 70	2. 75-4. 00
May	3. 50-55. 65	2. 00-4. 75	3. 25-5. 00	3. 50-4. 50	3. 25-4. 25
June	3. 35-55. 70	1. 85-4. 80	3. 00-4. 45	3. 20-4. 45	3. 00-4. 25
July	3. 10-55. 25	2. 00-4. 80	2. 40-4. 35	3. 50-5. 35	2. 30-4. 05
August	3. 00-55. 25	1. 95-5. 00	3. 00-4. 50	3. 00-5. 25	1. 85-3. 70
September	2. 90-55. 40	1. 80-3. 75	2. 45-4. 90	2. 75-5. 25	1. 65-4. 20
October	3. 75-55. 35	1. 60-3. 75	2. 75-5. 20	3. 40-5. 50	1. 75-4. 00
November	3. 25-55. 40	1. 70-3. 80	2. 50-4. 75	3. 30-5. 20	1. 65-4. 00
December	3. 00-55. 65	2. 10-5. 00	3. 00-4. 65	3. 10-5. 30	1. 85-3. 80

Range of prices, per hundredweight, of hogs at Chicago and Omaha in 1906, by months, and annual range at Chicago, 1892-1906.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Heavy pack- ing (250-500 pounds).	Mixed pack- ing (200-250 pounds).	Light bacon (150-200 pounds).
January	\$5. 00-55. 72½	\$4. 95-57. 10	\$4. 90-55. 62½
February	5. 45-55. 42½	5. 40-55. 42½	5. 40-55. 37½
March	6. 00-55. 62½	6. 00-55. 55	5. 95-55. 55
April	6. 10-55. 82½	6. 20-55. 80	6. 20-55. 75
May	6. 15-55. 67½	6. 15-55. 65	6. 15-55. 62½
June	6. 15-55. 85	6. 20-55. 82½	6. 15-55. 85
July	6. 00-7. 00	6. 20-7. 00	6. 30-7. 00
August	5. 45-55. 57½	5. 70-55. 67½	5. 85-55. 75
September	6. 35-55. 77½	5. 60-55. 82½	5. 85-55. 80
October	5. 85-55. 85	5. 95-55. 85	5. 90-55. 75
November	5. 70-55. 50	5. 85-55. 50	5. 85-55. 45
December	6. 00-55. 95	5. 90-57. 10	5. 75-7. 00
Annual range:			
1906	5. 00-7. 00	4. 95-57. 10	4. 90-7. 00
1905	4. 35-55. 40	4. 25-55. 42½	4. 10-55. 45
1904	4. 10-55. 30	4. 15-55. 37½	4. 00-55. 30
1903	3. 85-55. 77½	3. 90-55. 80	3. 90-55. 70
1902	5. 70-55. 82½	5. 65-55. 80	5. 40-55. 95
1901	4. 80-55. 77½	4. 85-55. 70	4. 75-55. 70
1900	4. 15-55. 85	4. 15-55. 82½	4. 10-55. 75
1899	3. 35-55. 45	3. 40-55. 00	3. 30-55. 00
1898	3. 10-55. 40	3. 10-55. 40	3. 10-55. 45
1897	3. 00-55. 45	3. 20-55. 45	3. 20-55. 45
1896	2. 40-55. 45	2. 75-55. 45	2. 80-55. 45
1895	3. 20-55. 45	3. 25-55. 55	3. 25-55. 70
1894	3. 90-55. 75	3. 90-55. 85	3. 50-55. 45
1893	3. 80-55. 75	4. 25-55. 85	4. 40-55. 55
1892	3. 70-55. 90	3. 60-55. 85	3. 60-55. 85

* This price was paid for hogs at the International Live Stock Exposition.

OMAHA.

Month.	Heavy pack- ing (275-500 pounds).	Mixed pack- ing (230-270 pounds).	Light bacon (150-225 pounds).
January	\$4. 90-55. 50	\$4. 90-55. 45	\$4. 85-55. 42½
February	5. 40-55. 20	5. 35-55. 15	5. 25-55. 10
March	6. 00-55. 35	5. 95-55. 32½	5. 85-55. 37½
April	6. 20-55. 55	6. 15-55. 52½	6. 10-55. 55
May	6. 10-55. 45	6. 10-55. 40	6. 12½-55. 40
June	6. 20-55. 60	6. 17½-55. 55	6. 10-55. 50
July	6. 15-55. 75	6. 25-55. 67½	6. 27½-55. 72½
August	5. 45-55. 20	5. 60-55. 25	5. 80-55. 45
September	5. 40-55. 22½	5. 60-55. 30	5. 80-55. 45
October	5. 92½-55. 35	6. 00-55. 40	6. 02½-55. 50
November	5. 80-55. 15	5. 90-55. 20	5. 95-55. 27½
December	5. 90-55. 22½	6. 00-55. 30	6. 00-55. 35

Range of prices, per hundredweight, of sheep at Chicago and Omaha in 1906, by months, and annual range at Chicago, 1892-1906.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Native sheep (60-140 pounds).	Native year- lings and lambs.	Western sheep (70-140 pounds).	Western and Mexican lambs.
January.....	\$3.75-\$6.00	\$5.50-\$8.00	\$3.75-\$6.25	\$6.00-\$8.00
February.....	3.50-6.25	5.25-7.50	3.50-6.00	5.50-7.35
March.....	3.50-6.25	5.25-7.50	3.50-6.00	5.50-7.35
April.....	3.75-6.25	5.00-7.00	3.50-6.50	5.00-7.50
May.....	3.75-6.50	5.00-6.85	4.00-6.50	5.25-7.75
June.....	3.50-6.25	5.00-7.50	3.50-6.25	5.00-8.00
July.....	3.00-6.25	5.00-8.50	3.00-6.00	5.25-8.40
August.....	3.50-5.50	5.00-8.25	3.00-5.50	5.50-8.00
September.....	3.50-5.75	5.00-8.00	4.00-6.70	5.85-8.00
October.....	3.75-5.50	5.00-7.75	3.50-5.75	4.75-7.75
November.....	3.25-5.75	5.00-7.85	3.25-5.75	5.00-7.75
December.....	3.50-6.50	5.00-8.15	3.00-7.00	6.25-11.25
Annual range:				
1906.....	3.00-6.50	5.00-8.50	3.00-7.00	4.75-11.25
1905.....	2.75-6.35	4.00-8.25	3.15-6.35	4.50-8.20
1904.....	1.50-6.00	2.50-7.75	2.00-5.80	3.00-7.50
1903.....	1.25-7.00	2.50-8.00	2.00-7.00	2.50-7.90
1902.....	1.25-6.50	2.00-7.25	1.25-6.30	2.50-7.60
1901.....	1.40-6.25	2.00-6.25	1.50-5.25	2.75-5.90
1900.....	2.00-6.50	3.00-7.60	3.00-6.50	4.00-7.60
1899.....	2.25-5.65	3.50-7.45	2.50-5.55	4.00-7.00
1898.....	2.00-5.25	3.50-7.10	3.00-5.25	3.75-6.75
1897.....	1.25-5.25	3.00-6.40	2.15-5.35	3.50-7.25
1896.....	1.00-4.60	2.75-6.50	2.15-4.30	3.50-6.25
1895.....	1.25-5.50	2.25-6.35	2.50-5.35	3.00-6.00
1894.....	1.00-5.40	2.00-6.00	2.00-5.40	2.50-5.80
1893.....	1.50-6.25	2.25-7.55	2.50-6.45	2.25-6.75
1892.....	2.25-6.90	3.00-8.25	3.00-6.75	3.50-7.25

* International show lambs sold at auction December 6 at \$11.25, the highest on record. They were range bred.

OMAHA.

Month.	Native sheep.	Native lambs.	Western sheep.	Western lambs.
January.....	\$4.00-\$6.40	\$5.90-\$7.75	.....	.....
February.....	3.50-6.25	6.15-7.25	.....	.....
March.....	2.75-6.00	5.75-6.75	.....	.....
April.....	3.25-6.15	5.25-7.10	.....	.....
May.....	4.50-6.40	5.00-7.25	.....	.....
June.....	3.80-6.50	6.50-8.25	.....	\$5.75-\$7.75
July.....	4.00-6.25	5.50-7.50	\$3.25-\$6.25	5.00-7.75
August.....	4.50-5.85	5.75-6.85	4.25-6.00	6.00-7.50
September.....	4.25-5.85	5.50-7.00	4.00-6.00	6.00-7.50
October.....	4.75-5.65	5.50-7.25	4.00-6.35	5.00-7.30
November.....	4.50-6.10	6.50-7.40	4.00-6.20	5.25-7.30
December.....	4.75-6.85	6.50-6.75	4.00-6.15	5.50-7.50

Spring lambs (March and April), \$12.

Average prices of horses at Chicago and range of prices at Omaha in 1906, by months, and annual average at Chicago, 1900-1906.

[Compiled from reports of stock-yard companies.]

CHICAGO.

Month.	Draft horses.	Carriage teams.	Drivers.	General use.	Busseers and trammers.	Saddlers.	Southern chunks.
January	\$182	\$487	\$157	\$132	\$142	\$167	\$74½
February	192	502	162	137	152	172	79½
March	192	507	167	142	157	182	79½
April	192	512	167	142	157	182	79½
May	187	502	167	142	157	187	74½
June	187	497	162	137	152	182	72½
July	182	492	157	132	142	172	69½
August	182	487	157	132	142	172	69½
September	182	482	152	132	142	172	69½
October	182	482	152	132	142	172	69½
November	187	482	152	127	142	167	69½
December	182	477	152	122	142	167	67½
Annual average:							
1906	188	486	158	154	147	174	72½
1905	186	486	156	132	145	172	70½
1904	177	475	150	140	140	160	64
1903	171	465	150	122	140	156	62
1902	166	450	145	117	135	151	57
1901	157	400	137	102	121	147	52
1900	155	410	140	105	115	150	50

OMAHA.

Month.	Draft horses.	Carriage teams.	Drivers.	General use.	Chunks.	Western.	Southern.
January	\$140-\$225	\$300-\$400	\$100-\$175	\$85-\$135	\$100-\$140	\$10-\$50	\$40-\$90
February	140-225	300-450	100-175	85-135	100-140	10-50	35-90
March	140-250	300-450	100-175	85-135	100-150	10-50	35-90
April	140-275	300-500	100-175	80-130	100-160	10-50	30-75
May	140-335	300-750	100-350	75-110	100-175	15-50	30-85
June	135-275	300-750	100-300	75-150	90-165	15-115	30-75
July	125-225	300-400	100-150	75-150	75-135	15-120	40-90
August	130-225	300-400	100-200	75-150	75-130	15-120	40-90
September	130-225	300-500	100-225	75-150	75-125	15-122	40-90
October	140-250	300-450	100-200	75-150	75-125	15-80	40-90
November	150-250	300-450	125-200	85-150	75-125	15-75	35-90
December	150-250	300-400	125-200	85-150	75-125	15-65	35-90

WHOLESALE PRICES OF MEAT.

The information contained in the accompanying table is intended to supplement the live-weight prices of farm animals at the principal stock yards, found elsewhere in this article. No attempt is made to give the prices of all the various grades of beef, mutton, pork, etc., as this would take up too much space and would besides not be consistent with the main object in view, which is to make a comparison rather than a record of the prices of meat at the principal markets of this country and Europe. For this purpose a representative high grade has been selected for each class of meat, excluding, however, all fancy or "extra" grades, and the markets chosen were Chicago, New York, London, Berlin, and Paris. The prices quoted are taken from standard trade papers, and are shown at monthly periods and for the same day of the month in all cases. The data for the European markets have been converted at the standard rates to the United States equivalents in pounds and cents.

Regarding the meat situation generally in 1906, it has already been stated that about the middle of the year public opinion was for a time highly inflamed because of certain so-called disclosures concerning methods of working in the large packing plants, and the trade was considerably upset in consequence. The public prejudice was, however, directed less against the fresh meats than against the canned and sausage product. The table shows that the best grades of meat fully held their own throughout the year. There was, in fact, a reaction toward this class of meat, and while the inferior grades lost ground during the progress of the agitation the choice grades were always in brisk demand, and the year as a whole was one of remarkable prosperity for producers of good market stock.

BEEF.

It will be noticed in the table that the Chicago and New York prices kept an even pace with each other for the first seven months of the year, but in August and for several succeeding months the New York prices advanced noticeably. The meat agitation previously referred to was probably the cause of this increase.

It is of interest to notice the variation between the price of hind quarters in Chicago and of American refrigerated hind quarters in London. There is little, if any, difference in grade between the two classes, and the cost of freight between the two places is in the neighborhood of 1 cent a pound. Bearing this in mind, it will be seen that for the last three months of the year there was apparently a good margin of profit in the London sales over Chicago prices, while for most of the remaining months the margin was very slight, and in January the quotations indicate a loss. The prices of hind quarters, it may be mentioned, average $1\frac{1}{2}$ to 2 cents a pound higher than those for the whole side of beef. The London-killed American beef is of course slightly higher than the chilled variety, as dealers are enabled to market it in a condition similar to the native-killed product. British beef, it will be seen, averages about 1 cent a pound higher than the London-killed American.

The Germans have to pay dearly for their beef, the Berlin price averaging fully 100 per cent higher than Chicago. This is partly owing to the agrarian policy of excluding foreign meats from their markets, and as a result the poorer classes of people are compelled to fall back on certain inferior grades of animal flesh. In this connection it may be stated that according to a consular report from Germany there were in round numbers 182,000 horses and 7,000 dogs slaughtered for food in that country during 1906.

The prices of beef at the Paris wholesale market are rather peculiar. In the first place the range is extreme, denoting a very mixed quality

of product, and while the quotations are invariably far below those of Berlin the top price is in several instances even below that of London (for native beef), notwithstanding the fact that the French regulations are, like those of Germany, restrictive in regard to foreign meats.

VEAL.

Veal is a high-priced article in the European markets, particularly in Germany, and even in New York for the greater part of the year it rates about 5 cents a pound higher than beef. The quotations for carcasses in Chicago, it will be seen, are fully 3 cents a pound lower than New York in the majority of instances.

The best grade of veal in Germany is no doubt a choice product, but the price is exceedingly high, averaging around 20 cents a pound, which is about double the Chicago price and is many cents above the Paris and London figures, these being about on a par.

MUTTON.

Mutton commands a higher price than beef in the United States, carcasses of good sheep bringing fully 1 cent a pound more than those of good native steers. In Europe the difference is still more marked. First-class mutton appears to be the most highly esteemed of all meats by the Parisians. The quotations in the Paris markets for this article are higher even than those for lamb. It will be seen, too, that the Paris figures for mutton occasionally exceed those of Berlin, this being the only case (excepting English spring lamb, for which fancy prices are paid) where the German prices are not uniformly higher than all the others.

LAMB.

There are no quotations for native British lamb during the three winter months, but from March to July, inclusive, the prices exceed any on the list. The Berlin prices are the highest for the remaining months, and they average throughout the year 5 to 6 cents a pound in excess of Chicago and New York. French lamb, like their beef, is of considerably mixed quality, judging from the large range in the quotations, and, as before stated, even the best does not command as high a price as their choice mutton.

PORK.

Chicago and New York dressed hogs were practically even in price throughout the year, during the last six months of which there was a perceptible stiffening in values, particularly at Chicago. The table shows the European prices to be much more uniform with pork than

with other meats. The French was slightly the lowest in price, the English coming next. There are some instances, however, where the German prices are lower than the English. Taken as a whole, European pork averages fully 5 cents higher than ours.

Wholesale prices per pound of stated grades of fresh meats at Chicago, New York, London, Berlin, and Paris, at monthly periods, 1906.

Class of meat and location of market.	Jan. 5.	Feb. 2.	Mar. 2.	Apr. 6.	May 4.	June 1.
BEEF.						
	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>
Chicago—Good native steers, carcass	7½-8½	7½-8½	7½-8½	7½-8	7½-8	8½
Good native steers, hind quarters	9-9½	9-9½	9-9½	9-9½	8½-9½	10½
New York—Choice native steers, heavy carcass	8½	8½	8½	8½	8½	8½
London—Choice British long sides	11½-11½	11½-11½	11½-11½	11½-11½	11½-11½	11½-12½
American (London killed)	8½-10	9½-10½	9½-10½	9½-10½	9½-10½	11-12
Berlin—American refrigerated, hind quarters	7½-9½	10½-11½	9½-10½	9½-10½	10½-11½	10½-11½
Berlin—Fat oxen	15½-16½	15½-16½	15½-16½	15-16	15½-16½	15½-16½
Paris—Hind quarters	8½-14	8-12½	8-12½	5½-8½	8½-14	8½-16
VEAL.						
Chicago—Good carcass	10½-11	10½-11	10½-11	10-10½	9-9½	10
New York—Prime veals	14-14½	14-14½	14-14½	13	10½	11
London—Best veals	16½-18½	16½-17½	15½-16½	18½-14½	18½-14½	18½-14½
Berlin—Choice whole-milk fed (above 220 pounds)	20-21½	18½-19½	19½-20	19-19½	18½-19½	20½-21½
Paris—First quality	15-16½	14-16½	15-16½	18½-14½	18½-15	14½-16½
MUTTON.						
Chicago—Good sheep	9½-10	9½-10	9½-10	9½-10	9½-10	9
New York—Choice sheep	9½	9½	9	9	11	11
London—Choice native	13½-14½	13½-15½	13½-14½	14½-15½	14½-17½	17½-18½
Berlin—Fat wethers	15½-16½	15½-16½	15½-16½	14½-16	14½-15	16-16½
Paris—First quality	15-16½	15½-17	16½-17½	16½-17½	15½-17	16½-17½
LAMB.						
Chicago—Round dressed lambs	12-12½	12½	11½-12	11-11½	11-11½	11½-12½
New York—Spring lambs, choice	13	12	11½	11	12-12½	15-16
London—Choice native			21½-24½	19½-22½	18½-21½	17½-20½
Berlin—Fat lambs	16½-17½	16½-17½	16½-17½	15½-16½	16½-16½	17½-17½
Paris—Lambs without head	9½-16½	9½-16½	11½-16½	10½-16½	8½-16½	8½-16½
PORK.						
Chicago—Dressed hogs	7-7½	7-7½	7½-8½	7½-8½	7½-8½	8½-8½
New York—Hogs, medium weight	7½-7½	7½	8½-8½	8½-8½	9	8½
London—Best (small and medium)	12½-13½	13½-14½	13½-14½	13½-16½	13½-14½	13½-14½
Berlin—Choice, medium weight	16½	16½	16½	15½	13½	13½
Paris—First quality	11½-12½	11½-12½	12½-13½	12½-13½	13½-14½	13½-14½

Wholesale prices per pound of stated grades of fresh meats, etc.—Continued.

Class of meat and location of market.	July 6.	Aug. 3.	Sept. 7.	Oct. 5.	Nov. 2.	Dec. 7.
BEEF.						
Chicago—Good native steers, carcass.....	<i>Cents.</i> 84-84	<i>Cents.</i> 74	<i>Cents.</i> 74-8	<i>Cents.</i> 74-84	<i>Cents.</i> 74-84	<i>Cents.</i> 74-84
Good native steers, hind quarters.....	94-10	104	104-11	94-104	9-10	84-94
New York—Choice native steers, heavy carcass.....	84	9	9-94	94	9-10	9-94
London—Choice British long sides.....	134-144	124-134	134-144	124-134	124-124	114-124
American (London killed).....	94-104	104-114	104-114	94-11	11-124	94-114
American refrigerated, hind quarters.....	104-114	114-124	104-124	114-124	114-134	104-124
Berlin—Fat oxen.....	16-164	17-18	19-194	184-19	184-194	184-19
Paris—Hind quarters.....	84-164	7-184	7-14	54-114	54-134	7-14
VEAL.						
Chicago—Good carcass.....	104	94	104-11	10-114	10-104	10
New York—Prime veals.....	114	13	134	144	14	14
London—Best veals.....	134-144	104-124	134-144	124-144	134-164	164-164
Berlin—Choice whole-milk fed (above 220 pounds).....	194-204	174-194	194-204	204-214	204-214	204-22
Paris—First quality.....	124-134	114-124	124-134	114-124	164-174	164-18
MUTTON.						
Chicago—Good sheep.....	94-11	9	9-10	9-10	9	9
New York—Choice sheep.....	104-11	9-10	10-104	10	10	10
London—Choice native.....	164-184	164-174	164-184	164-164	144-154	144-154
Berlin—Fat wethers.....	154-164	17-174	174-18	164-174	164-174	164-174
Paris—First quality.....	16-164	164-164	114-164	14-15	164-164	164-174
LAMB.						
Chicago—Round dressed lambs.....	13-144	124	13-14	13-14	13	12-13
New York—Spring lambs, choice.....	15	124	14	14	13	134-13
London—Choice native.....	164-194	164-164	154-174	164-164	144-154	144-154
Berlin—Fat lambs.....	17-174	184-184	184-19	18-184	184-19	184-184
Paris—Lambs without head.....	84-154	84-164	104-16	7-16	16-164	164-114
PORK.						
Chicago—Dressed hogs.....	9-94	94-94	94-94	94-94	94-94	94-94
New York—Hogs, medium weight.....	94	94	94	94-94	84	94
London—Best (small and medium).....	124-134	124-134	134-144	144-154	134-144	134-144
Berlin—Choice, medium weight.....	144	15	154	154	144	134
Paris—First quality.....	134-144	124-134	124-134	114-124	124-134	124-134

* This price is for short sides, long sides not being quoted. The price for short sides averages 1 cent per pound higher than for long sides.

THE MOVEMENT OF LIVE STOCK.

The following two tables present the movement of farm animals to and from the various packing centers and live-stock markets of the country, the first showing annual totals of the receipts and shipments for the past three years and the second the totals at each city for the year 1906. These figures are compiled from reports of Bureau inspectors, who have in many cases obtained their information from stock-yard and railroad companies. It should be noted that the figures do not refer to so many separate animals, as there are necessarily many duplications, owing to the fact that the stock arriving at a certain center may be passed on to one or more additional centers before being finally disposed of. By subtracting the shipments from the receipts, however, there is shown in a general way the local consumption of live stock in the several cities named; these, it may be stated, include all places containing abattoirs where Government inspection is maintained. In like manner the first

table gives this information for the whole country. But it must be remembered that the totals by no means indicate the entire slaughter throughout the country; they show only the wholesale commercial slaughter and do not take into account the slaughter by the local butchers in the small towns and the consumption on farms, each of which amounts in the aggregate to a large total. It must be borne in mind, too, that the consumption in several of the large packing centers is not entirely local, nor even national, inasmuch as they not only distribute their products all over the United States, but export large quantities to foreign countries as well.

Total commercial movement of live stock in United States, 1904-1906.

Animals.	1904		1905		1906	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>	<i>Number.</i>
Cattle	12, 136, 135	5, 638, 708	13, 777, 196	6, 187, 004	14, 101, 040	5, 990, 574
Calves	1, 516, 984	399, 204	1, 826, 554	421, 570	2, 257, 012	458, 069
Hogs	88, 769, 524	10, 433, 224	40, 889, 462	10, 631, 775	40, 952, 762	10, 966, 559
Sheep	19, 637, 182	9, 340, 147	19, 313, 259	8, 810, 271	20, 638, 128	9, 022, 171
Horses and mules	783, 197	626, 474	820, 400	689, 350	856, 145	726, 637
Total	73, 392, 972	26, 432, 752	76, 626, 871	26, 789, 970	78, 857, 087	27, 164, 010

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Receipts and shipments of live stock at stock centers during the calendar year 1906.

Stock center.	Cattle.		Calves.		Hogs.		Sheep.		Horses and mules.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
Allentown, Pa.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.	Number.
Alton, Ill.	15,819	1,068	846	54,113	56,294	2,080	2,080	4,500	2,600	
Arkansas City, Kan.	1,068	13	1,500	56,294	56,294	2,080	2,080	4,500	2,600	
Auburn, Me.	1,000	808	26,123	157,963	157,963	8,909	8,909	2,500		
Austin, Minn.	670	113,829	201	179,761	179,761	827,013	176,094	8,994	8,404	
Baltimore, Md.	179,806	223	1,003	822	822	16,699	4,562			
Bangor, Me.	4,362	3,522	1,003	822	822	147	16,724			
Billings, Mont.	4,362	3,522	1,003	822	822	147	16,724			
Bloomington, Ill.	8,760	134,074	99,154	1,221,515	1,221,515	38,007	38,451	3,180	2,580	
Boston, Mass.	211,217	134,074	99,154	1,221,515	1,221,515	38,007	38,451	213	213	
Bridgeport, Pa.	542					18,587				
Brightwood, Mass.	428,875	357,525	123	156,598	156,598	18,587				
Broadaxe, Pa.	1,754	1,821	61,800	3,961,150	3,961,150	1,976,900	1,610,200	57,498	53,014	
Buffalo, N. Y.	1,754	1,821	61,800	3,961,150	3,961,150	1,976,900	1,610,200	1,152	1,476	
Burlington, Iowa	1,754	1,821	61,800	3,961,150	3,961,150	1,976,900	1,610,200	242	258	
Burlington, Vt.	1,754	1,821	61,800	3,961,150	3,961,150	1,976,900	1,610,200			
Cairo, Ill.	382	44	311	10	10	199	46			
Cedar Rapids, Iowa	14,121	576	92	1,277	1,277	3,112	3,112			
Chester, Pa.	860	119	576	687,201	687,201	2,102	2,102			
Chicago, Ill.	3,329,250	1,852,986	413,269	7,275,063	7,275,063	4,806,449	1,341,273	126,979	106,604	
Cincinnati, Ohio	245,389	71,597	72,788	942,842	942,842	320,210	282,116	25,816	10,067	
Cleveland, Ohio	45,784	180	54,190	761,606	761,606	273,509	224,582			
Coffeyville, Kans.	2,549	255	255	8,949	8,949	1,053				
Columbus, Ohio	2,549	255	255	8,949	8,949	1,053				
Cortland, N. Y.	571	7	209	7,178	7,178	287	8			
Cortland, N. Y.	571	7	209	7,178	7,178	287	8			
Cudahy, Wis.	22,098	1,758	14,082	10,757	10,757	5,756	1,068	183	129	
Dallas, Tex.	7,703	216	2,400	560,888	560,888	18,288				
Davenport, Ill.	501	6	216	2,400	2,400	845				
Davenport, Iowa	501	6	216	2,400	2,400	845				
Dayton, Ohio	21,779	2,751	2,408	88,456	88,456	24				
Denver, Colo.	1,828,751	285,726	473	134,238	134,238	10,017	4,507	805	241	
Des Moines, Iowa	30,012	2,817	473	191,726	191,726	825,766	796,480	18,571	13,498	
Detroit, Mich.	68,439	13,184	37,889	379,070	379,070	121,811	45,000	4,567	887	
Dubuque, Iowa	5,085		1,369	2,516	2,516	6,181			464	
Duluth, Minn.	5,085		1,369	2,516	2,516	6,181				
Eau Claire, Wis.	13,679	378	4,662	42,017	42,017	2,769	108	381	389	
Evansville, Ind.	13,679	378	4,662	42,017	42,017	2,769	108	1,625		
Fort Atkinson, Wis.	120,560			16,880	16,880	420	420	788	738	
Fort Madison, Iowa	1,094			16,880	16,880	420	420			
Fort Wayne, Ind.	608,811	79,168	284,289	560,661	560,661	97,514	12,062	21,903	16,400	
Fort Worth, Tex.	608,811	79,168	284,289	560,661	560,661	97,514	12,062	21,903	16,400	
Harrisburg, Pa.	608,811	79,168	284,289	560,661	560,661	97,514	12,062	21,903	16,400	

Haverhill, Mass. <i>g</i>	112	15,072	82	12,109	430	1,012	1,535	1,535
Houston, Tex.	30,959	15,072	19,686		87,863	2,463	4,452	4,452
Hutchinson, Kans.	444,102	434,141			94,898	13,444	105,254	105,254
Indianapolis, Ind.	135,016	131,972			1,893,853	682,487	30,101	26,254
Jacksonville, Ill.	2,364		613		10,237			
Jacksonville, W. Va.	103	47	133	30	2,679	551		
Jersey City and Weehawken, N. J. <i>i</i>	846,013	319,513	136,214	76,014	720,334	60,068	655,566	932
Kansas City, Kans.	2,256,979	948,688	256,515	99,577	2,675,601	92,131	478,252	65,714
La Crosse, Wis.	1,500	800	700		15,000	6,000		
Lafayette, Ind. <i>h</i>	2,648		1,265		21,963		99	13
Logansport, Ind. <i>g</i>	84		25		3,802			
Los Angeles, Cal.	64,781		2,941		90,132			
Louisville, Ky.	140,788	66,964	30,946	14,827	818,077	509,989	298,516	10,149
Madison, Ind. <i>g</i>	84		136	12	668	2,100	3,700	360
Manakato, Minn.	1,078	191			1,885	837		
Marshalltown, Iowa.	668		145		113,125			
Mason City, Iowa.	822		71		35,044			
Milwaukee, Wis.	41,963	7,181	58,231	816	508,149	1,550	3,381	961
Nashville, Tenn.	126,349	4,799			101,395	66,281	12,372	64,883
National Stock Yards, Ill.	1,121,880	134,632			1,923,209	588,444	107,638	166,398
Nebraska City, Nebr.	1,121,880	134,632			222,339	135	149	67
Newark, N. J.	32,667	687	49,998		470,862	161,426		153,538
New Haven, Conn.					166,447			
New Orleans, La. <i>g</i>	13,889	881	889		2,476	350		
Newport News, Va.	6,506	6,311				801	0.757	
New York, N. Y.	77,284	251,954			801,399	587,457	88,285	8,934
Norfolk, Va.	7,799	4,924			7,317	1,362	15,805	15,989
Ogden, Utah.	17,870	17,870			20,530	20,580	13,825	13,825
Olathe, Kans. <i>g</i>			80		1,775		205,614	
Omaha, Nebr.	1,079,373	1303,342			2,388,551	170,663	1,176,042	83,962
Ottumwa, Iowa.	9,884		2,747		638,083	1,588	3,090	3,970
Paris, Ill.	1,072	1,488			3,585	7,976	550	240
Patterson, N. J.	4,376		6,580		113,880	44,320		
Peoria, Ill.	19,183	13,568			396,005	308,563	1,239	1,857
Philadelphia, Pa. <i>o</i>	256,717	140,390	58,704	2,771	275,015	8,659	468,396	15,198
Pittsburg, Kans. <i>g</i>	2,292	618	114	20	7,800	2,845	40,787	8,546

a The returns are for seven months, June to December.

b The shipments from Baltimore include exports as follows: Cattle, 48,002; sheep, 13,474.

c The returns cover four months, September to December.

d The shipments from Boston include exports as follows: Cattle, 107,978; sheep, 17,765; horses, 213.

e The shipments from Buffalo include exports as follows: Cattle, 180; sheep, 3,040.

f Returns are for November and December only.

g Returns cover October to December only.

h The shipments from Chicago include exports as follows: Cattle, 34,352; sheep, 1,414.

i Includes calves.

j Includes 120 goats.

k Includes 106 burros.

l The shipments from Jersey City include exports as follows: Cattle, 99,141; hogs, 39; sheep, 13,372; horses, 952; mules, 280.

m Returns cover July to December only.

n Includes 48 goats.

o The shipments from Philadelphia include 45,845 cattle and 6 horses exported.

p 499 horses exported.

Receipts and shipments of live stock at stock centers during the calendar year 1906—Continued.

Stock center.	Cattle.		Calves.		Hogs.		Sheep.		Horses and mules.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
Pittsburg, Pa.	448,688	203,865	116,330	66,687	1,541,315	1,171,900	754,431	508,310		
Fort Huron, Mich. ^a					6,769					
Portland, Me. ^b	48,183	48,170			25,300	12,580	19,902	19,819	4	4
Portland, Ore.	c 82,975	c 19,248	19		17,658		75,065	48,299	5,866	5,069
Pottsville, Pa. ^a	127				23,725					
Providence, R. I. ^a					20,243		4,636			
Pueblo, Colo.	2,865		1,850		48,849		4,408			
Quincy, Ill.	3,187		1,251		22,718	11,705	165,153	186,389	5,513	6,628
Reno, Nev.	c 69,446	c 65,903			22,000	10,000	3,500	2,500	8,000	2,500
Richmond, Ind.	c 8,000	c 2,000			52,462	1,851	14,885	2,924		
Richmond, Va.	c 21,711	c 8,682			1,908,307	60,981	828,784	207,024	28,480	28,285
St. Joseph, Mo.	553,525	143,211	52,662	5,941	324,576	108,606	53,438	7,964	4,040	3,564
St. Louis, Mo.	98,027	19,497	59,677	14,404	860,110	13,736	735,269	580,067	9,298	8,823
St. Paul, Minn.	426,987	848,874	42,587	31,864	26,106	10,263	18,988	16,774	17,455	12,183
San Antonio, Tex.	76,681	49,640	34		3,387		6,847			
San Diego, Cal.	6,523	1,442			133,194	1,947	680,782	8,488	840	162
San Francisco, Cal. ^a	186,270	680	31,764	258	4,409		418			
Scranton, Pa. ^a	171		2		78,133		161,227	58,686	4,612	
Seattle, Wash.	38,179	1,610	466		1,197,947	144,612	64,167	38,907	18,963	16,496
Sioux City, Iowa.	373,886	229,891	11,870	6,164	2,133					
Southboro, Mass. ^a										
Syracuse, N. Y.	1,515		1,167		80,628		623			
Tacoma, Wash.	26,617				33		54,657			
Tia Juana, Cal.	1,025				104,645	69,214	f 4,860			7
Toledo, Ohio.	9,456	2,686	3,938	1,014	116,211		4,467	2,196	11	
Topeka, Kans.	6,555	1,282	1,280		484		616			
Trenton, N. J. ^a	633		280		2,747		5,082			
Troy, N. Y.	2,084		1,891		32,688		550			
Washington, D. C. ^a	3,610				2,747				4	
Waterloo, Iowa.	507		206		49,961					
West Newberry, Mass.	884		753		289		1			
Wheeling, W. Va. ^a	217		167		6,370		208			
Wichita, Kans.	46,717	29,426			300,909	34,245	6,012	8,660	2,108	2,096
Wilmington, Del. ^a	1,669		226		5,108		844			
Worcester, Mass.					154,495					
Total.....	14,101,040	6,990,574	2,287,012	458,069	40,962,762	10,966,559	20,688,128	9,022,171	888,145	726,687

^a Returns cover October to December only.^b The shipments from Portland, Me., include exports as follows: Cattle, 40,072; sheep, 7,172.^c Includes calves.^e Returns are for November and December only.^f Includes 200 goats.^g Includes 38 asses.^d The shipments from San Francisco include exports as follows: Cattle, 36; hogs, 976; horses, 37; mules, 10.

LIVE-STOCK EXHIBITIONS.

Live-stock exhibitions are an important educational factor for improvement in breeding and feeding. The two principal exhibitions of the year 1906 were the "American Royal" at Kansas City in October and the "International" at Chicago, December 1 to 8. At each of these shows there was brought together a splendid collection of fine breeding and fat stock, both as individual exhibits and in carload lots. In the number and high quality of exhibits and in magnitude of attendance the International Exposition of 1906 surpassed all previous exhibitions. There were on exhibition in this show 6,043 animals, as follows:

Exhibits at the International Live Stock Exposition at Chicago, December, 1906.

Class.	Individual exhibits.	Carload exhibits.		Total exhibits.
	Animals.	Cars.	Animals.	Animals.
Cattle, fat.....	1,067	97	1,455	2,522
Cattle, feeders.....		39	780	780
Horses.....	609			609
Sheep.....	897	17	877	1,774
Hogs.....	258	2	100	358
Total.....	2,831	155	3,212	6,043

Most of the animals were in the younger classes, and the grand champion of the show was a Hereford calf 11 months old.

The following table shows some results of the sale of fat cattle exhibited at the International Exposition at Chicago in 1906:

Eighty-one carloads (15 head per load), comprising 74 loads of steers, 5 of heifers, and 2 of cows, were exhibited and sold, as against 65 loads in 1905. The bulk of the sales of steers was made at from \$7 to \$9 per hundredweight. Of the 74 loads of steers, 8 loads, including the sweepstakes load which sold at \$17 per hundredweight and the champion yearlings which brought \$11.60 per hundredweight, sold at over \$9, and only 5 loads sold under \$7. The average price for the entire sale of steers was \$8.12 per hundredweight, as against \$6.71 for 1905 and \$7.56 for 1904, while the range of price per hundredweight for the entire lot was from \$6.60 to \$17.

Range of prices and average prices per hundredweight of steers exhibited and sold at the International Live Stock Exposition at Chicago, 1906, as classified by weight.

Weight classification (pounds).	Number of carloads.	Range of prices per hundredweight.	Average price per hundredweight.
900-1,000.....	3	\$6.75- \$7.65	\$7.32
1,000-1,100.....	11	6.75- 9.75	7.70
1,100-1,200.....	14	7.10-11.60	8.43
1,200-1,300.....	10	7.10- 8.60	7.83
1,300-1,400.....	7	6.60- 9.00	7.70
1,400-1,500.....	12	6.85-17.00	8.70
1,500-1,600.....	10	7.10-10.30	8.34
1,600-1,700.....	5	7.40- 8.20	7.87
1,700-1,800.....	2	7.35- 8.20	7.77

The sale of fat cattle in carload lots gave nearly equal results for the breeds represented, excepting for the Aberdeen-Angus, whose average was exceptionally high. The high average price brought by this breed was due principally to the exceptionally high prices brought by four prize-winning loads, which included the sweepstakes load at \$17 per hundredweight, the champion yearlings at \$11.60 per hundredweight, and two other loads which brought \$10.30 and \$10.25 per hundredweight, respectively.

The results of the sale by breeds are given in the following table:

Average weights and prices per hundredweight and range of prices of various breeds of steers exhibited and sold at the International Live Stock Exposition at Chicago, 1906.

Breed.	Number of carloads.	Number of head.	Average weight per head (pounds).	Average price per hundredweight.	Range of price.
Aberdeen-Angus.....	27	405	1,349	\$9.53	\$7.00-\$17.00
Hereford.....	28	420	1,278	7.90	6.75- 9.75
Shorthorn.....	16	240	1,303	7.84	6.75- 9.00
Galloway.....	1	15	1,476	7.75	7.75
Mixed breeds.....	2	30	1,232	7.67	7.00- 7.75

The carloads of heifers and cows exhibited in the fat classes sold at very much lower prices than the steers. The average price brought by the heifers was \$5.11 per hundredweight, or \$3 less than the average price paid for the steers. The average price paid for the two loads of cows was only \$4.65 per hundredweight.

The results of the sale of heifers and cows, by carloads of 15 head, were as follows:

Carloads.	Average weight per head (pounds).	Average price per hundredweight.
Heifers.....	1,253	\$4.10
	1,132	4.80
	1,130	6.10
	1,056	6.10
	992	4.45
Average for 5 loads.....	1,113	5.11
Cows.....	1,351	4.90
	1,066	4.40

REGISTERED LIVE STOCK IN THE UNITED STATES.

It has been the custom for the past three years to publish in the Annual Report of the Bureau of Animal Industry the estimates of secretaries of American pedigree record associations of the number of registered animals living in the United States on December 31 of each year, but this information can not now be presented for the year 1906 because no estimates have been made for that year, it having been decided to change the date of making estimates to June 30. It is expected that the figures for June 30, 1907, will be given in the Bureau report for that year.

CERTIFIED PEDIGREE RECORD ASSOCIATIONS.

Paragraph 473 of the tariff act of July 24, 1897 (amended March 3, 1903), provides that—

Any animal imported by a citizen of the United States specially for breeding purposes shall be admitted free, whether intended to be so used by the importer himself or for sale for such purpose: *Provided*, That no such animal shall be admitted free unless purebred, of a recognized breed, and duly registered in the books of record established for that breed: *And provided further*, That certificate of such record and of the pedigree of such animal shall be produced and submitted to the customs officer, duly authenticated by the proper custodian of such book of record, together with the affidavit of the owner, agent, or importer that such animal is the identical animal described in said certificate of record of pedigree: *And provided further*, That the Secretary of Agriculture shall determine and certify to the Secretary of the Treasury what are recognized breeds and purebred animals under the provisions of this paragraph.

Accordingly, the Department of Agriculture has certified a large number of books of record of pedigrees and their publishing agencies and has prescribed regulations for them, which have been published in B. A. I. Order No. 136. A list of the certified records and associations will be found in that order on page 352 of this report.

STATE LIVE-STOCK BREEDERS' ASSOCIATIONS.

[Revised to July 1, 1907.]

Name of organization.	Secretary.	Address.
Alabama Live Stock Association.....	D. T. Gray.....	Auburn, Ala.
Arizona Cattle Growers' Association.....	Harry L. Heffner.....	Pantano, Ariz.
California Live Stock Breeders' Association.....	E. W. Major.....	Berkeley, Cal.
Colorado Cattle and Horse Growers' Association.....	Fred. P. Johnson.....	P. O. Box 1509, Denver, Colo.
Connecticut Sheep Breeders' Association.....	Burton C. Patterson.....	Torrington, Conn.
Southeastern Stock Growers' Association.....	Z. C. Chambliss.....	Ocala, Fla.
Georgia Dairy and Live Stock Association.....	C. L. Willoughby.....	Experiment, Ga.
Hawaiian Live Stock Breeders' Association.....	Albert F. Judd.....	Honolulu, Hawaii.
Idaho Wool Growers' Association.....	J. E. Clinton, Jr.....	Boise, Idaho.
Inland Stock Breeders' Association.....	W. A. Linklater.....	Pullman, Idaho.
Illinois Live Stock Breeders' Association.....	O. H. Swigart.....	Farmer City, Ill.
Indiana Live Stock Breeders' Association.....	J. H. Skinner.....	Lafayette, Ind.
Indiana Swine Breeders' Association.....	Chas. S. Hemenway.....	Zionsville, Ind.
Indiana Wool Growers' Association.....	H. H. Kelm.....	Ladoga, Ind.
Iowa Improved Stock Breeders' Association.....	W. J. Kennedy.....	Ames, Iowa.
Iowa Swine Breeders' Association.....	C. C. Carlin.....	8408 Fifth street, Des Moines, Iowa.
Interstate Breeders' Association.....	F. L. Wirick.....	Sioux City, Iowa.

State live-stock breeders' associations—Continued.

Name of organization.	Secretary.	Address.
Kansas Improved Stock Breeders' Association.....	H. A. Heath	Topeka, Kans.
Kansas Swine Breeders' Association	I. D. Graham	Topeka, Kans.
Kentucky Beef Cattle Breeders' Association.....	J. J. Hooper	Lexington, Ky.
Kentucky Live Stock Breeders' Association.....	Clarence Sales	23 Board of Trade Building, Louisville, Ky.
Kentucky Swine Breeders' Association.....	M. W. Neale.....	514 Third street, Louisville, Ky.
Louisiana Stock Breeders' Association.....	W. H. Dalrymple.....	Baton Rouge, La.
Eastern Horse Breeders' Association	J. E. Osborne	Calala, Me.
Massachusetts Cattle Owners' Association.....	J. L. Harrington.....	Lunenburg, Mass.
Michigan Improved Live Stock Breeders' Association.....	A. C. Anderson.....	Agricultural College, Mich.
Minnesota Horse Breeders' Association.....	Geo. W. Patterson.....	Worthington, Minn.
Minnesota Live Stock Breeders' Association	Andrew Boss	St. Anthony Park, St. Paul, Minn.
Minnesota Sheep Breeders' Association.....	C. W. Glotfelter.....	Waterville, Minn.
Minnesota Swine Breeders' Association	St. A. Gaumnitz.....	St. Anthony Park, St. Paul, Minn.
Southern Live Stock Association	J. M. Aldrich	Michigan City, Miss.
Missouri State Sheep Breeders' Association.....	M. V. Carroll	Sedalia, Mo.
Improved Live Stock Breeders' Association.....	George B. Ellis	Columbia, Mo.
Central Montana Wool Growers' Association.....	A. C. Logan	Billings, Mont.
Montana Registered Cattle Breeders' Association.....	John W. Pace	Helena, Mont.
Montana Stock Growers' Association.....	H. R. Wells.....	Miles City, Mont.
North Montana Roundup Association.....	T. A. Cummings	Fort Benton, Mont.
Nebraska Improved Live Stock Breeders' Association.....	R. H. Searle	Edgar, Nebr.
Nebraska State Swine Breeders' Association.....	W. G. Unitt	Seward, Nebr.
Nebraska Stock Growers' Association.....	E. M. Searle, jr.	State Capitol, Lincoln, Nebr.
Cattle Growers' Association of New Mexico.....	Will C. Barnes	Las Vegas, N. Mex.
Cattle and Horse Protective Association of Central New Mexico.....	J. W. Medley	Magdalena, N. Mex.
New Mexico Wool Growers' Association.....	H. F. Lee.....	Albuquerque, N. Mex.
Northeastern New Mexico Stock Growers' Association.....	L. F. Wilson	Folsom, N. Mex.
New York State Breeders' Association.....	Albert E. Brown.....	Batavia, N. Y.
New York State Sheep Breeders' Association.....	W. W. Smallwood.....	Warsaw, N. Y.
North Dakota Live Stock Association.....	W. B. Richards.....	Agricultural College, N. Dak.
Ohio Horse Breeders' Association.....	Samuel Taylor	Grove City, Ohio.
Ohio Live Stock Association.....	C. S. Plumb	Columbus, Ohio.
Ohio Swine Breeders' Association	Ernst Freigau	Do.
Oklahoma Improved Breeders' Association.....	J. A. Spalding	Pondcreek, Okla.
Oklahoma Live Stock Association	W. E. Bolton	Woodward, Okla.
Oregon Live Stock Breeders' Association.....	M. D. Wisdom	Portland, Oreg.
Pennsylvania Live Stock Breeders' Association.....	E. S. Bayard	East End, Pittsburg, Pa.
South Carolina Live Stock Association.....	Lewis A. Klein.....	Clemson College, S. C.
Missouri River Stockmen's Association.....	John Hayes	Fort Pierre, S. Dak.
Northwestern Stock Growers' Association.....	A. W. F. Sellers.....	Bellevue, S. Dak.
South Dakota Improved Live Stock and Poultry Breeders' Association.....	James W. Wilson.....	Brookings, S. Dak.
Western South Dakota Stock Growers' Association.....	F. M. Stewart.....	Buffalo Gap, S. Dak.
Tennessee Live Stock Breeders' Association.....	May Overton.....	42 Arcade, Nashville, Tenn.
Cattle Raisers' Association of Texas.....	H. E. Crowley	Fort Worth, Tex.
Texas Swine Breeders' Association.....	M. M. Ofut	Cleburne, Tex.
Texas Sheep and Goat Breeders' Association.....	R. A. Bradford	Taylor, Tex.
Utah Cattle Growers' Association.....	Wesley K. Walton.....	Woodruff, Utah.
Mount Pleasant Wool Growers' Association.....	F. C. Jensen	Mount Pleasant, Utah.
Utah Cattlemen's Association.....	J. Wesley Walton.....	Salt Lake City, Utah.
Utah Wool Growers' Association.....	Henry Moss	443 Constitution Building, Salt Lake City, Utah.
Washington Live Stock Association	F. M. Rothrock.....	East 917 Augusta avenue, Spokane, Wash.
West Virginia Live Stock Association.....	C. E. Lewis.....	Savannah, W. Va.
West Virginia Sheep Breeders' Association.....	J. B. Huyett	Charlestown, W. Va.
Wisconsin Live Stock Breeders' Association.....	F. H. Scribner.....	Rosendale, Wis.
Wisconsin Sheep Breeders' Association.....	William F. Renk	Sun Prairie, Wis.
Snake River Live Stock Association.....	Harry L. Hays	Dixon, Wyo.
Wyoming Stock Growers' Association.....	Miss Alice Smith.....	Cheyenne, Wyo.
Wyoming Wool Growers' Association.....	George S. Walker.....	1614 Capitol avenue, Cheyenne, Wyo.

CONTAGIOUS DISEASES OF ANIMALS IN FOREIGN COUNTRIES.

The reports of contagious diseases of animals in foreign countries, as shown on the following pages, have been compiled from official documents received from the different countries. The figures are generally given by months, and in most instances they refer to new cases occurring during each month. In some instances, however, the figures in the returns refer to the number of cases, outbreaks, etc., at monthly periods, so that no annual totals can be given.

The outstanding feature in the situation for the year was the spread of foot-and-mouth disease in western continental Europe. The reports indicate that the disease began to spread in France about the middle of the year. Up to this time it had apparently been under control for some time. In 1905 there had been only 18 scattered outbreaks during the whole year, and for the first four months of 1906 there were but 3 outbreaks (in January). In May, however, there appears to have been a recrudescence of the disease, and the outbreaks rapidly increased in number month by month until, in November and December, there were upward of 2,000 in each month.

In November the disease spread into the neighboring countries of Belgium and the Netherlands. After experiencing entire freedom from the disease for eighteen months—that is, since March, 1905—the Belgium reports showed 1,907 cases in November, 1906, and so rapid was the spread of the infection that no less than 5,878 cases were reported in December. The Netherlands was not seriously affected.

Aside from foot-and-mouth disease, the status of the other livestock diseases in Belgium during 1906 was quite satisfactory, almost all the totals showing decreases when compared with 1905. There were no cases of sheep scab reported from March, 1905, until March, 1906, when 200 were reported, after which there was a further cessation lasting seven months, 41 cases being reported in November and 2 in December.

The reports from France show that pleuro-pneumonia has been entirely eradicated, no outbreaks having been reported since September, 1905. There was not much change in the other animal diseases as compared with 1905 excepting the great increase in foot-and-mouth disease, previously mentioned, and a substantial decrease in glanders and farcy. Rabies continues to be very prevalent, there being a total of 2,045 cases reported during the year.

The German reports show that no pleuro-pneumonia has existed in that country since June, 1906. As regards foot-and-mouth disease, a small number of farms continue right along to be infected, and the number was somewhat increased in the last two months of the year. Hog cholera and swine plague are the serious farm diseases in Germany, but the reports for the last six months of 1906, although they show an average of about 2,300 farms infected at each monthly period, are a considerable improvement on the year previous.

The situation in Great Britain and Ireland is seen by the tables to be very satisfactory; in only one instance—swine fever in Great Britain—was there an increase in the totals when compared with 1905.

The Italian reports, as usual, show a great prevalence of foot-and-mouth disease, the aggregate for the year—84,257 cases—being about 8,000 in excess of the total for 1905.

The details for each country in alphabetical order are as follows:

AUSTRIA.

Number of premises infected with contagious diseases of animals in Austria at monthly periods during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease	8	14	69	28	22	143
Anthrax	5	5	5	28	19	13
Glanders and farcy	12	9	9	13	11	15
Scab	37	52	81	114	155	162
Blackleg	2	3	3	8	4	1
Erysipelas of swine	50	26	49	44	96	201
Hog cholera and swine plague	185	195	363	459	371	511
Blisters upon genitals	17	66	164	212	188	225
Rabies	30	30	47	41	51	37

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Foot-and-mouth disease	392	451	143	305	273	263
Anthrax	9	73	47	39	27	27
Glanders and farcy	20	20	15	8	6	7
Scab:						
Horses	107	116	96	63	41	23
Sheep	4	4	4	5	2	1
Goats	45	25	8	4	4	6
Blackleg	6	14	3	.....	8	5
Erysipelas of swine	538	1,243	1,313	1,008	628	399
Hog cholera and swine plague	645	638	701	609	576	510
Blisters upon genitals	132	92	102	69	58	41
Rabies	18	25	19	22	20	23

BELGIUM.

Cases of contagious diseases of animals in Belgium during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy	12	10	5	5	8	2
Foot-and-mouth disease .....	.....	.....	.....	.....	.....	.....
Rabies	8	9	6	8	6	17
Anthrax	70	55	70	96	62	50
Blackleg	17	15	21	16	19	25
Foot rot	411	.....	.....	.....	.....	.....
Sheep scab .....	.....	.....	200	.....	.....	.....

Cases of contagious diseases of animals in Belgium during 1906—Continued.

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Glanders and farcy.....	2	1	.....	8	2	1	46
Foot-and-mouth disease.....	.....	.....	.....	.....	1,907	5,878	7,779
Rabies.....	6	6	7	11	6	6	91
Anthrax.....	61	48	52	43	30	38	675
Blackleg.....	28	80	87	27	25	21	276
Foot rot.....	.....	.....	.....	18	45	10	484
Sheep scab.....	.....	.....	.....	.....	41	2	243

CAPE COLONY.

Number of outbreaks of contagious diseases in Cape Colony (South Africa), during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax.....	8	5	9	5	5	5
Sponziekte (blackleg).....	3	18	23	9	12	12
Epizootic lymphangitis.....	1	2	2	.....	.....	2
Glanders.....	12	6	8	7	5	6
Lung sickness.....	31	26	24	81	47	58
Red water.....	16	48	29	11	21	4
Scabies (equine).....	.....	1	.....	.....	2	4
Swine fever.....	.....	.....	1	.....	.....	.....
Tuberculosis.....	1	8	1	2	1	3

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax.....	2	8	2	5	14	3	66
Sponziekte (blackleg).....	7	5	6	9	17	12	133
Epizootic lymphangitis.....	.....	.....	2	.....	.....	2	9
Glanders.....	9	9	5	7	4	10	88
Lung sickness.....	64	61	46	63	55	49	555
Red water.....	4	3	.....	3	8	8	156
Scabies (equine).....	.....	1	.....	1	6	.....	15
Swine fever.....	.....	.....	.....	.....	.....	.....	1
Tuberculosis.....	.....	.....	1	.....	.....	1	13

DENMARK.

Outbreaks of contagious diseases of animals in Denmark during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax.....	32	7	16	11	18	8
Spinal meningitis.....	1	8	3	2	4	1
Glanders and farcy.....	.....	.....	4	4	1	2
Malignant catarrhal fever.....	4	6	5	10	5	11
Erysipelas of swine.....	5	8	5	7	22	16
Hog cholera.....	.....	.....	1	3	5	1

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax.....	3	10	8	4	17	16	150
Spinal meningitis.....	.....	.....	1	4	5	1	25
Glanders and farcy.....	3	5	2	3	2	1	27
Malignant catarrhal fever.....	18	7	12	8	5	4	90
Erysipelas of swine.....	21	21	34	20	81	15	206
Hog cholera.....	1	5	1	.....	.....	1	18

FRANCE.

Status of contagious diseases of animals in France during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease (outbreaks)	3				10	71
Sheep scab (outbreaks)	17	43	14	16	23	27
Sheep pox (outbreaks)	1	5		2	1	60
Anthrax (outbreaks)	38	23	37	33	32	16
Blackleg (outbreaks)	72	54	68	37	38	54
Glanders and farcy:						
Number of outbreaks	53	35	35	49	39	35
Horses slaughtered	60	48	50	83	79	42
Rabies (cases)	173	158	175	226	192	185
Erysipelas of swine (outbreaks)	24	20	23	18	30	32
Infectious pneumo-enteritis of swine (outbreaks)	8	9	19	21	38	9

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Foot-and-mouth disease (outbreaks)	306	853	1,285	1,417	2,008	2,110	8,050
Sheep scab (outbreaks)	55	11	9	9	3	4	231
Sheep pox (outbreaks)	9	42	30	26	15	9	200
Anthrax (outbreaks)	65	43	47	41	64	32	471
Blackleg (outbreaks)	52	30	100	114	132	30	381
Glanders and farcy:							
Number of outbreaks	33	37	34	25	19	29	423
Horses slaughtered	36	43	34	33	27	36	571
Rabies (cases)	155	186	139	156	161	139	2,045
Erysipelas of swine (outbreaks)	41	39	30	51	72	46	426
Infectious pneumo-enteritis of swine (outbreaks)	7	4	11	8	6	4	144

GERMANY.

Number of localities and farms infected with contagious diseases of animals in Germany on the first day of each month during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Glanders and farcy:						
Localities	47	46	48	54	57	29
Farms	71	63	54	66	73	37
Pleuro-pneumonia:						
Localities	2	2	2	2	2	1
Farms	2	2	2	2	2	1
Foot-and-mouth disease:						
Localities	7	11	12	16	38	21
Farms	7	15	14	20	56	30
Hog cholera and swine plague:						
Localities	2,946	3,114	3,567	3,684	3,653	1,657
Farms	4,919	4,311	4,787	4,789	4,917	2,585

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Glanders and farcy:						
Localities	24	24	30	29	30	33
Farms	33	33	35	37	37	46
Pleuro-pneumonia:						
Localities						
Farms						
Foot-and-mouth disease:						
Localities	5	3	4	2	23	69
Farms	5	4	8	4	35	121
Hog cholera and swine plague:						
Localities	1,647	1,638	1,543	1,643	1,753	1,673
Farms	2,348	2,211	2,123	2,347	2,479	2,624

GREAT BRITAIN.

Annual status of animal diseases in Great Britain, 1901-1906.

Diseases.	1901.	1902.	1903.	1904.	1905.	1906.
Foot-and-mouth disease:						
Outbreaks.....	12					
Cases.....	669					
Glanders and farcy:						
Outbreaks.....	1,847	1,155	1,456	1,529	1,214	1,070
Cases.....	2,370	2,040	2,499	2,658	2,068	2,012
Sheep scab:						
Outbreaks.....	1,587	1,632	1,792	1,418	918	534
Cases.....	22,674	21,523	24,481			
Anthrax:						
Outbreaks.....	651	678	767	1,049	970	939
Cases.....	971	1,082	1,143	1,589	1,317	1,325
Rabies (cases).....	1					
Swine fever:						
Outbreaks.....	3,140	1,688	1,478	1,196	817	1,280
Swine slaughtered (diseased of exposed).....	15,237	8,268	7,983	5,603	3,876	7,359

HUNGARY.

Number of premises infected with contagious diseases of animals in Hungary at monthly periods during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax.....	12	14	42	67	78	125
Rabies.....	52	52	105	111	89	127
Glanders and farcy.....	28	27	39	69	86	81
Foot-and-mouth disease.....	24	25	16	45	43	146
Sheep pox.....	104	102	78	52	28	8
Blisters upon genitals.....	14	8	13	130	191	250
Scab.....	129	275	521	1,180	1,151	993
Erysipelas of swine.....	180	118	114	126	236	1,349
Hog cholera (districts).....	441	362	332	306	328	758
Barbone of buffalo.....				1	8	10

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Anthrax.....	112	136	116	88	64	36
Rabies.....	122	136	129	109	97	91
Glanders and farcy.....	70	65	57	72	78	57
Foot-and-mouth disease.....	282	321	265	113	35	9
Sheep pox.....	11	29	136	182	184	168
Blisters upon genitals.....	171	141	56	36	47	81
Scab.....	796	525	299	212	254	240
Erysipelas of swine.....	2,726	2,162	2,250	1,769	972	593
Hog cholera (districts).....	1,259	1,553	1,519	1,255	989	784
Barbone of buffalo.....	10	19	26	26	27	40

IRELAND.

Number of outbreaks and cases of contagious diseases of animals in Ireland, annually, 1901-1906.

Diseases.	1901.	1902.	1903.	1904.	1905.	1906.
Anthrax:						
Outbreaks.....	2	.....	4	4	4	4
Cases.....	4	.....	11	7	4	8
Glanders and farcy:						
Outbreaks.....	5	10	5	11	30	8
Cases.....	6	43	7	34	107	16
Rabies:						
Cases.....	2	.....	2	.....	.....	.....
Sheep scab:						
Outbreaks.....	545	613	655	486	339	256
Cases.....	7,564	7,818	8,306	6,433	4,258	3,513
Swine fever:						
Outbreaks.....	220	166	175	181	137	95
Cases.....	1,325	993	1,079	981	1,416	1,108
Epizootic lymphangitis:						
Outbreaks.....	.....	.....	.....	1	10	1
Cases.....	.....	.....	.....	1	25	1
Parasitic mange:						
Outbreaks.....	174	161	195	162	169	85
Cases.....	381	221	295	252	322	130

ITALY.

Cases of contagious diseases of animals in Italy during 1906.

Name of disease.	Jan.	Feb.	Mar. ^a	Apr.	May.	June. ^a
Anthrax.....	498	48	84	118	150	178
Blackleg.....	24	11	11	20	34	19
Foot-and-mouth disease.....	8,429	3,901	3,270	2,115	1,808	1,508
Tuberculosis.....	57	73	49	111	147	94
Glanders and farcy.....	22	33	39	32	30	30
Sheep pox.....	1,215	3,398	2,096	5,187	2,878	.....
Sheep scab.....	429	18	28	29	43	21
Rabies.....	808	734	098	701	1,338	1,645
Infectious disease of swine.....	63	68	425	60	467	823
Contagious mammitis of sheep and goats.....	.....	1	.....	.....	.....	8,924
Barbone of buffalo.....	.....	.....	.....	.....	.....	.....

Name of disease.	July.	Aug.	Sept.	Oct.	Nov. ^a	Dec.	Total.
Anthrax.....	403	2,119	707	407	114	126	4,952
Blackleg.....	16	34	16	26	20	26	257
Foot-and-mouth disease.....	2,187	6,700	13,631	18,166	9,068	13,458	84,257
Tuberculosis.....	112	151	124	110	148	185	1,256
Glanders and farcy.....	27	45	77	39	47	28	449
Sheep pox.....	81	.....	1	.....	.....	.....	82
Sheep scab.....	1,090	1,156	653	36	338	1,037	19,070
Rabies.....	26	47	25	25	51	50	792
Infectious disease of swine.....	3,007	2,540	1,436	1,243	1,337	998	17,080
Contagious mammitis of sheep and goats.....	4,430	567	187	54	41	338	7,623
Barbone of buffalo.....	.....	120	26	23	.....	.....	9,094

^a Report for one week not received.

THE NETHERLANDS.

Cases of contagious diseases of animals in the Netherlands during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Foot-and-mouth disease						
Glanders and farcy ^a	5	5		3	2	2
Sheep scab	121	354	13	120	38	230
Foot rot of sheep	11	6	18	4	1	2
Anthrax	59	50	52	55	40	24
Erysipelas of swine	5	8	12	8	23	75
Rabies			6	4	3	5

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Foot-and-mouth disease					2	104	106
Glanders and farcy ^a	2	4	7	13	6	3	^a 53
Sheep scab	91	153	371	182	106	45	1,826
Foot rot of sheep	2	12	26	81	106	30	299
Anthrax	23	19	37	40	29	35	463
Erysipelas of swine	151	335	569	167	32	18	1,398
Rabies	1		37	10	12	7	85

^a During the year 45 of the cases were horses imported from England for slaughter. The 8 native cases occurred—4 in October, 3 in November, and 1 in December.

NORWAY.

Number of cases of contagious diseases of animals in Norway during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	42	47	73	60	89	74
Blackleg	2	3	1	5		2
Braxy of sheep	12	7	3	7	14	
Malignant catarrh	43	33	54	47	36	44

Name of disease.	July. ^a	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Anthrax		28	33	59	51	51	612
Blackleg		3	4	3	3	1	27
Braxy of sheep				11	15	12	38
Malignant catarrh		32	40	30	33	26	418

^a Report for July not available.

SWEDEN.

Outbreaks of contagious diseases of animals in Sweden during 1906.

Name of disease.	Jan.	Feb.	Mar.	Apr.	May.	June.
Anthrax	19	13	31	30	37	32
Blackleg	2	2	1	1	2	10
Hemorrhagic septicemia of swine	1	1		1	1	

Name of disease.	July.	Aug.	Sept.	Oct. ^a	Nov.	Dec.	Total.
Anthrax	24	20	13		12	15	251
Blackleg	8	4	8		7		45
Hemorrhagic septicemia of swine					1		5

^a Report for October not available. Digitized by Google

SWITZERLAND.

Cases of contagious diseases of animals in Switzerland during 1906.

Name of disease.	Jan. ^a	Feb.	Mar.	Apr.	May.	June.
Blackleg.....	5	16	16	11	40	87
Anthrax.....	15	85	67	17	55	22
Foot-and-mouth disease.....		8	85			81
Glanders and farcy.....	3		1	1		1
Erysipelas of swine ^b	238	308	265	274	344	574
Sheep scab.....	87				26	74

Name of disease.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Blackleg.....	176	280	144	82	90	6	908
Anthrax.....	28	80	30	32	30	25	386
Foot-and-mouth disease.....	169	210	22	59	269	134	1,062
Glanders and farcy.....							6
Erysipelas of swine ^b	601	772	363	427	307	119	4,592
Sheep scab.....	42		200		70	110	559

^a Report for one week not received.^b Includes hog cholera.

PUBLICATIONS OF THE BUREAU DURING 1906.

Following is a list of publications issued by the Bureau of Animal Industry during the year 1906, excepting regulations, which are to be found in the appendix to this report. Circular 106 (not included in this list because issued since the end of 1906), giving a list of the publications of the Bureau since its organization and indicating those which are available and how they may be obtained, will be sent free upon request.

Publications in the following list for which no price is indicated will be sent free of charge to persons in the United States, so long as the editions permit, on application to the Secretary of Agriculture, Washington, D. C.

Applications for publications to which a price is affixed should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., the officer designated by law to sell Government publications. All payments should be made to him and not to the Department of Agriculture, and should be sent by postal money order, express order, or New York draft. Currency may be sent at the sender's risk, but postage stamps, foreign money, and uncertified checks will not be accepted. No charge is made for postage on documents forwarded to points in the United States, Guam, Hawaii, the Philippine Islands, or Porto Rico, or to Canada, Cuba, or Mexico. To other countries the regular rate of postage is charged, and remittances must cover such postage. To residents of foreign countries the price of 6 cents a copy, including postage, has been fixed for publications for which no price is indicated in the list.

REPORTS.

Report of the Chief of the Bureau of Animal Industry for [the fiscal year ended June 30.] 1905. By D. E. Salmon. Pp. 37.

Report of the Chief of the Bureau of Animal Industry for [the fiscal year ended June 30,] 1906. By A. D. Melvin. Pp. 56.

BULLETINS.

Bulletin 27, revised. Information Concerning the Angora Goat. By George Fayette Thompson, Editor, Bureau of Animal Industry. Revised by Sallie Russell Reeves. Pp. 77, pls. 15, figs. 2. Price 15 cents.

Bulletin 38. Tuberculosis of the Food-Producing Animals. By D. E. Salmon. Pp. 99, pls. 9. Price 40 cents.

- Bulletin 39. Index-Catalogue of Medical and Veterinary Zoology. By Ch. Wardell Stiles, Consulting Zoologist, and Albert Hassall, Assistant in Zoology. Part 14. Authors: L to Léger. Pp. 951-1044. Price 10 cents.
- Same*, Part 15. Authors: Legg to van der Linden. Pp. 1045-1116. Price 10 cents.
- Same*, Part 16. Authors: von Linden to Lyutkevich. Pp. 1117-1208. Price 10 cents.
- Bulletin 82. Fungi in Cheese Ripening: Camembert and Roquefort. By Charles Thom, Mycologist in Cheese Investigations, Dairy Division. Pp. 39, figs. 3. Price 5 cents.
- Bulletin 83. The Cold Storage of Cheese. (Experiments of 1903-4.) By Clarence B. Lane, Assistant Chief of Dairy Division. Pp. 26, pls. 6, figs. 4. Price 10 cents.
- Bulletin 84. Investigations in the Manufacture and Storage of Butter. I.—The Keeping Qualities of Butter Made Under Different Conditions and Stored at Different Temperatures. By C. E. Gray, Dairy Expert, Dairy Division. With Remarks on the Scoring of the Butter. By G. L. McKay, Professor of Dairying, Iowa State College. Pp. 24. Price 10 cents.
- Bulletin 85. Investigations in the Manufacture and Curing of Cheese. VI.—The Cold Curing of American Cheese, with a Digest of Previous Work on the Subject. By C. F. Doane, Expert in Dairying, Dairy Division. Pp. 68. Price 10 cents.
- Bulletin 86. Experiments with Milk Artificially Infected with Tubercle Bacilli. By E. C. Schroeder, Superintendent of Experiment Station, and W. E. Cotton, Expert Assistant. Pp. 19. Price 10 cents.
- Bulletin 87. Market Milk Investigations. II.—The Milk and Cream Exhibit at the National Dairy Show, 1906. By Clarence B. Lane, Assistant Chief of Dairy Division. Pp. 21, pls. 4. Price 10 cents.
- Bulletin 88. The Tuberculin Test of Hogs and Some Methods of Their Infection with Tuberculosis. By E. C. Schroeder, Superintendent of Experiment Station, and John R. Mohler, Chief of Pathological Division. Pp. 51. Price 10 cents.
- Bulletin 89. Investigations in the Manufacture and Storage of Butter. II.—Preventing Molds in Butter Tubs. By L. A. Rogers, Bacteriological Chemist, Dairy Division. Pp. 13, fig. 1. Price 5 cents.
- Bulletin 90. Poultry Investigations at the Maine Agricultural Experiment Station. By Charles D. Woods and Gilbert M. Gowell, of the Maine Agricultural Experiment Station. Pp. 42, pls. 5, figs. 2. Price 15 cents.
- Bulletin 91. Feeding Prickly Pear to Stock in Texas. By David Griffiths, Assistant in Charge of Range and Cactus Investigations, Bureau of Plant Industry. Pp. 23, pls. 3, fig. 1. Price 10 cents.
- Bulletin 93. The Relation of Tuberculous Lesions to the Mode of Infection. By E. C. Schroeder, Superintendent of Experiment Station, and W. E. Cotton, Expert Assistant. Pp. 19. Price 5 cents.

CIRCULARS.

- Circular 89. The Preparation of Emulsions of Crude Petroleum. By T. M. Price, Biochemic Division. Pp. 4.
- Circular 90. Suggestions for the Construction of a Modern Dairy Barn. Prepared in the Dairy Division. Pp. 6, figs. 2.
- Circular 91. Bacillus Necrophorus and Its Economic Importance. By John R. Mohler and George Byron Morse, Pathological Laboratory. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 42.

- Circular 92. The Poultry Industry of Petaluma, Cal. By P. H. Lawler. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 8, pls. 3. Out of print.
- Circular 93. The Life History of the Twisted Wireworm (*Hæmonchus contortus*) of Sheep and Other Ruminants. (Preliminary Report.) By B. H. Ransom, Scientific Assistant in Charge of Zoological Laboratory. Pp. 7, figs. 2.
- Circular 94. Foot Rot of Sheep. By John R. Mohler and Henry J. Washburn, Pathological Division. (Reprint from Twenty-first Annual Report, Bureau of Animal Industry, 1904.) Pp. 23, fig. 1.
- Circular 95. The Fecundity of Poland-China and Duroc-Jersey Sows. By George M. Rommel, Animal Husbandman. Pp. 12.
- Circular 96. Actinomycosis, or Lumpy Jaw. By D. E. Salmon and Theobald Smith. Revised by D. E. Salmon and John R. Mohler. (Reprint from Special Report on Diseases of Cattle, 1904.) Pp. 10.
- Circular 97. How to get Rid of Cattle Ticks. Prepared in the Inspection Division. Pp. 4, fig. 1.
- Circular 98. Some Unusual Host Relations of the Texas Fever Tick. By B. H. Ransom, Chief of Zoological Division. Pp. 8.
- Circular 99. Officials, Associations, and Educational Institutions Connected with the Dairy Interests of the United States for the Year 1906. Pp. 14.
- Circular 100. A Rapid Method for the Determination of Water in Butter. By C. E. Gray, Assistant Dairyman, Dairy Division. Pp. 6, figs. 2.

FARMERS' BULLETINS.

- Farmers' Bulletin 42, revised. Facts About Milk. By R. A. Pearson, Professor of Dairy Industry, New York State College of Agriculture at Cornell University. Pp. 32, figs. 8.
- Farmers' Bulletin 63, revised. Care of Milk on the Farm. By R. A. Pearson, Professor of Dairy Industry, New York State College of Agriculture at Cornell University. Pp. 40, figs. 11.
- Farmers' Bulletin 64, revised. Ducks and Geese: Standard Varieties and Management. By George E. Howard. Revised by G. Arthur Bell, Assistant Animal Husbandman. Pp. 55, figs. 32.
- Farmers' Bulletin 183, revised. Care of Meat on the Farm: Butchering, Curing, and Keeping. By Andrew Boss, of the College of Agriculture, University of Minnesota. Pp. 37, figs. 35.
- Farmers' Bulletin 258. Texas or Tick Fever and Its Prevention. By John R. Mohler, Chief of Pathological Division. Pp. 45, figs. 6.
- Farmers' Bulletin 261. The Cattle Tick in Its Relation to Southern Agriculture. By August Mayer. Pp. 22.

APPENDIX.

RULES AND REGULATIONS OF THE SECRETARY OF AGRICULTURE RELATING TO THE ANIMAL INDUSTRY, ISSUED IN 1906.

(RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after February 1, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that a contagious and infectious disease known as splenetic, southern, or Texas, fever exists among cattle in the following-named States and Territories, to wit:

CALIFORNIA, OKLAHOMA, INDIAN TERRITORY, TEXAS, ARKANSAS, LOUISIANA, MISSISSIPPI, TENNESSEE, ALABAMA, KENTUCKY, VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA, GEORGIA, AND FLORIDA.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority conferred by section 1 of the act of Congress approved March 3, 1905 (33 Stat., 1264), do hereby quarantine the following area, to wit:

All territory situate within the boundaries of California, Oklahoma, Indian Territory, Texas, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Florida, and that portion of the territory in the State of Kentucky situate in the counties of Clinton and Wayne and that portion of Pulaski County situate south of the Cumberland River and west of the South Fork of the Cumberland River.

It is ordered by this Rule, under the authority and discretion conferred on the Secretary of Agriculture by section 3 of the act of Congress approved March 3, 1905 (33 Stat., 1265), that cattle shall be moved from the area herein quarantined to any point not located in the said quarantined area only in accordance with the Regulations of the Secretary of Agriculture promulgated May 1, 1905, and effective June 1, 1905, as amended, subject to the following exceptions, to wit:

Exception 1.—The following-named States and Territory have established State and Territorial quarantine lines differing from the line established by the Secretary of Agriculture, which are as follows, to wit:

CALIFORNIA.

Beginning on the Pacific coast where the northern boundary line of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary line of San Luis Obispo County to its junction with the western boundary of Kings County; thence: northwesterly along the western boundary of Kings and Fresno counties to the western corner of Fresno County; thence northerly, easterly, and southerly along the western, northern, and eastern boundary line of Merced County to the southeast corner thereof; thence northeasterly along the northern boundary of Madera County to the northeast corner thereof; thence southerly and easterly along the eastern boundary lines of Madera, Fresno, and Tulare counties to the southeast corner of Tulare County; thence easterly along the southern boundary line of Inyo County to its intersection with the eastern boundary line of the State of California.

TEXAS.

Beginning at the intersection of the southern boundary of New Mexico with the international boundary line at the Rio Grande River; thence following along the said international boundary line to the southwest corner of the county of Pecos; thence following

the western boundary line of Pecos County to the point where the roadbed of the G., H. & S. A. Railroad crosses said line; thence in an easterly direction with the center of said roadbed to a point on Section No. 36, Block A2, G., H. & S. A. Railroad Company; thence north with the pasture fence, running in a northerly direction through the eastern part of Sections Nos. 13 and 12 of said Block A2 and across Section 1, G., C. & S. F. Railroad Company; thence continuing north with said pasture fence through the eastern part of Sections Nos. 16, 17, 46, 47, 76, 77, 106, 107, 136, 137, 142, 143, and 194, Block D, M., K. & T. E. Railroad Company; thence continuing in a northerly direction to a point on the north line of Section No. 6, Block 160, G., C. & S. F. Railroad Company, same being corner of pasture fence; thence east with the north line of Sections Nos. 6, 9, 10, 11, 12, 15, 16, Block 160, G., C. & S. F. Railroad Company, to the northeast corner of said Section No. 16, the same being corner of pasture fence; thence in a northerly direction with the east boundary line of Sections Nos. 22, 21, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, to the northeast corner of said Section No. 37; thence west with the north boundary line of Sections Nos. 32 and 33, same block, to the northwest corner of Section No. 33, Block 1, C. C. S. D. & R. G. N. G. Railroad Company, corner of fence; thence north with the east boundary line of Sections Nos. 1, 12, 13, 24, 25, 36, 37, 48, 49, 60, 61, and 72, Block 2, C. C. S. D. & R. G. N. G. Railroad Company to the northeast corner of said Section No. 72; thence in an easterly direction with the pasture fence to the southeast corner of Section No. 9, patented to James E. Evans; thence north with the east line of said Section No. 9 to the northwest corner of Section No. 100, Block A2, T. C. Railroad Company; thence east with the north boundary line of said Sections Nos. 100 and 89, same block, to the northeast corner of said Section No. 89, Block A2, T. C. Railroad Company; thence north with the east boundary line of Sections Nos. 90, 91, 92, and 93 to the southeast corner of Section No. 94, Block A2, T. C. Railroad Company; thence northwest diagonally across Section No. 94 to the northwest corner of said section; thence continuing in a northwesterly direction diagonally across Sections Nos. 14, 18, and 28 to the northeast corner of Section No. 29, Block C4, G. C. & S. F. Railroad Company; thence west with the north boundary line of said Section No. 29 to the northwest corner of said section; thence northwest diagonally across Section No. 1, T. C. Railroad Company, Section No. 97, Block 194, G. C. & S. F. Railroad Company, to the northeast corner of Section No. 96; thence in a northerly direction across Section No. 94 to a point on its north boundary line 600 varas west of its northeast corner; thence continuing north through Sections Nos. 93, 90, 89, 86, 85, and 58, Block 194, G. C. & S. F. Railroad Company, to a point on the north boundary line of said Section No. 58; thence northwesterly with the pasture fence through Section No. 59 to the northeast corner of Section No. 82 and the southeast corner of Section No. 81, same block; thence continuing northwesterly to Section No. 17, H. & G. N. Railroad Company; thence north with the east line of said Section 17 to the Pecos River; thence northwesterly with said Pecos River to the northwest corner of Crockett County; thence east along the northern boundary of Crockett and Schleicher counties to the southeastern corner of Irion County; thence north along the eastern boundary of Irion County to the northeast corner of said county; thence continuing due north to the southern boundary line of Coke County; thence west with the southern boundary of Coke County to the southwest corner of Coke County; thence north along the western boundary of Coke County to the southern boundary of Mitchell County; thence east to the southeast corner of Mitchell County; thence north along the eastern boundary of Mitchell County to the northeast corner of said county; thence east along the southern boundaries of Fisher and Jones counties to the southeast corner of Jones County; thence north along the eastern boundary of Jones County to the northeast corner of said county; thence east along the southern boundary of Haskell County to the southeast corner of said county; thence north along the western boundary lines of Throckmorton and Baylor counties to the northwest corner of Baylor County; thence east along the southern boundary of Wilbarger County to the southeast corner of said county; thence north along the eastern boundary of Wilbarger County to the Red River; thence continuing in a northwesterly direction along the course of said river and the northern boundary of Texas to the southwest corner of Greer County, Oklahoma Territory; thence north, following the eastern boundary line of Texas to the northwest corner of said Greer County.

OKLAHOMA.

Beginning on the Red River at the northwestern corner of Wichita County, Tex.; thence northwesterly along the course of said river to the southwest corner of Greer County; thence north along the western boundary of Greer County to the northwest corner thereof; thence easterly and southerly along the southern boundary of Roger Mills County to the southeast corner of said county; thence east along the southern

boundary line of Washita County to the southeast corner of said county; thence north along the eastern boundary lines of Washita and Custer counties to the Canadian River; thence in a southeasterly direction along the course of said river to the southeast corner of Canadian County; thence north along the eastern boundary line of Canadian County to the northwest corner of Cleveland County; thence east along the northern line of Cleveland County to the middle of the right of way of the Atchison, Topeka and Santa Fe Railway; thence northerly following the middle of said right of way through Oklahoma, Logan, Noble, and Payne counties, and the Otoe and Missouri and Ponca Indian reservations to the northern boundary of the Ponca Indian Reservation; thence east along the northern boundary of the Ponca Indian Reservation to the Arkansas River; thence in a northerly direction following the course of the said river to its intersection with the thirty-seventh parallel of north latitude at the southern boundary line of Kansas.

TENNESSEE.

Beginning on the Mississippi River at the southeast corner of the State of Missouri at the western boundary of Tennessee; thence southerly along the western boundaries of the counties of Dyer and Lauderdale; thence following the main channel of the Mississippi River (leaving Island No. 37 to the north and west) to the northwestern corner of Shelby County, on the Mississippi River; thence easterly along the northern boundary lines of Shelby and Fayette counties to the southwestern corner of Haywood County; thence northerly along the western boundary line of Haywood County to the Big Hatchie River; thence southeasterly along said river to its intersection with the southern boundary line of Haywood County; thence east and north along the southern and eastern boundary lines of Haywood County to the northeastern corner of said county; thence following the northern boundary line of Madison County to the southwest corner of Carroll County; thence northerly and easterly along the western and northern boundary lines of Carroll County to the northeast corner of said county; thence southerly along the eastern boundary of said county to its intersection with the N. C. & St. L. Railway; thence easterly along the middle of the roadbed of said railway through Benton County to the intersection of said N. C. & St. L. Railway with the Tennessee River at the eastern boundary of Benton County; thence southerly along the eastern boundaries of Benton and Decatur counties to the northwest corner of Wayne County; thence easterly along the northern boundary line of Wayne County to the southeast corner of Perry County; thence northerly, easterly, and southerly along the western, northern, and eastern boundaries of Lewis County to the northern boundary line of Lawrence County; thence easterly along the northern boundary of Lawrence County to the northeast corner thereof; thence southerly along the eastern boundary of Lawrence County to the southeast corner thereof; thence east along the southern boundary of Giles County to Elk River; thence northeasterly along said river, through Giles and Lincoln counties, to the eastern boundary of Lincoln County; thence northerly and easterly along the western and northern boundaries of Moore County to the northeast corner of Moore County; thence northerly along the western boundary lines of Coffee and Cannon counties to the northwest corner of Cannon County; thence northeasterly and southeasterly along the northern and eastern boundaries of Cannon County to the boundary of Warren County; thence easterly along the northern boundary of Warren County to the western boundary of White County; thence northeasterly and southeasterly along the western and northern boundaries of White County to the western boundary of Cumberland County; thence southerly, easterly, and northeasterly along the western, southern, and eastern boundaries of Cumberland County to the northern corner of Rhea County; thence southerly along the eastern boundary lines of Rhea and James counties to the boundary line of Bradley County; thence northerly and southeasterly along the northern boundary lines of Bradley and Polk counties to the northeast corner of Polk County; thence southerly along the eastern boundary line of Polk County to the southeast corner thereof at the southwestern corner of North Carolina.

GEORGIA.

Beginning at the intersection of the western boundary line of Union County with the boundary line between the States of Georgia and North Carolina; thence southerly along the western boundary of Union County to the southwest corner thereof; thence northeasterly and easterly along the southern boundary lines of Union and Towns counties to the western corner of Rabun County; thence easterly, southeasterly, and northeasterly along the western, southern, and eastern boundaries of Rabun County to the northeast corner of said county on the boundary between Georgia and North Carolina.

NORTH CAROLINA.

Beginning at the southwest corner of the county of Cherokee; thence east along the southern boundary lines of the counties of Cherokee, Clay, Macon, Jackson, Transylvania, and Henderson to the southwest corner of the county of Polk; thence northerly along the western boundaries of Polk and Rutherford counties to the southern boundary of McDowell County; thence westerly, northerly, and northeasterly along the southern, western, and northern boundaries of McDowell County to the North Fork of the Catawba River; thence southerly along the course of said North Fork to the Catawba River; thence easterly along the course of said river to its intersection with the western boundary of Burke County; thence southerly and easterly along the western and southern boundaries of said county to the northeastern corner of Cleveland County; thence southerly along the eastern boundary of Cleveland County to the boundary line between North Carolina and South Carolina; thence easterly along said State boundary line to the Catawba River; thence northerly, following the course of the Catawba River, to the southwest corner of Iredell County; thence east along the southern boundary line of Iredell and Rowan counties to the right of way of the main line of the Southern Railway; thence northeasterly, following the right of way of said main line of the Southern Railway, to the Yadkin River; thence northerly along the course of said Yadkin River to the southeast corner of Yadkin County; thence westerly, northerly, and easterly along the southern, western, and northern boundaries of Yadkin County to the southeastern corner of Surry County; thence northerly along the eastern boundary of Surry County to its intersection with the northern boundary line of the State of North Carolina; thence westerly along the northern boundary line of the State of North Carolina to the southwestern corner of Patrick County, Virginia.

VIRGINIA.

Beginning at the boundary line of Virginia at its southwestern corner (Lee County); thence east along the southern boundary of Virginia to the southwestern corner of Patrick County; thence northerly and easterly along the western boundaries of Patrick and Franklin counties to the northernmost point of Franklin County; thence in a southeasterly and northeasterly direction along the southern and eastern boundaries of Bedford County to the James River; thence following the James River to the southeastern corner of Charles City County; thence northerly and easterly along the western and northern boundaries of James City County to the western boundary of Gloucester County at the York River; thence southerly and northerly along the southern and eastern boundaries of Gloucester County to the northeastern corner of said county; thence easterly and southerly along the northern and eastern boundaries of Mathews County to the southeastern point of said county; thence south to the northern boundary of Elizabeth City County; thence westerly and northerly along the boundaries of Elizabeth City and Warwick counties to the James River; thence southeasterly along the course of the said river to the northwest corner of Norfolk County; thence south along the western boundary of said county to its intersection with the northern boundary of North Carolina; thence east along the southern boundaries of Norfolk and Princess Anne counties to the Atlantic Ocean.

The States and Territory above named have enacted laws necessary to enforce said lines completely within their respective boundaries, and these quarantine lines, subject to the changes contained in *Exception 2*, are hereby adopted, to continue as provided in Regulation 11 of the Regulations of the Secretary of Agriculture, promulgated May 1, 1905, and effective June 1, 1905. *The area herein quarantined is modified accordingly.*

Exception 2.—That portion of the quarantine line for the State of Virginia described in *Exception 1*, beginning at the southwestern corner of Virginia (Lee County) and extending east along the southern boundary line of Virginia to the southwestern corner of Patrick County, Virginia, is hereby suspended during the continuance of the lines for the States of Tennessee and North Carolina, as described in *Exception 1*.

That portion of the quarantine line for the State of North Carolina described in *Exception 1*, beginning at the intersection of the northwest corner of Union County, Georgia, with the North Carolina State line and extending easterly along the southern boundary line of North Carolina to the northeast corner of Rabun County, Georgia, is hereby suspended during the continuance of the line for the State of Georgia as described in *Exception 1*.

Exception 3.—CALIFORNIA. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, Madera, and Merced. No cattle shall be moved or allowed to move, except as

provided for immediate slaughter, from the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, Madera, and Merced to any portion of the State of California located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of California; and no cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of California which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 4.—TEXAS. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Baylor and Throckmorton.

No cattle shall be moved or allowed to move from the counties of Childress, Cottle, Hardeman, Foard, Wilbarger, King, Knox, Haskell, Stonewall, Jones, Borden, Howard, Mitchell, Glasscock, Sterling, Irion, Reagan, Upton, Throckmorton, and Baylor to any portion of the State of Texas located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry, or by a duly authorized inspector of the State of Texas; and no cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Texas, which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 5.—OKLAHOMA. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Cleveland, Pottawatomie, Lincoln, Pawnee, those portions of Blaine and Canadian counties south of the Canadian River, that portion of Caddo County north of the right of way of the Chicago, Rock Island and Pacific Railway, that portion of Kiowa County lying north of Comanche County and the line between townships 4 and 5 north, extended westward to its intersection with the North Fork of Red River, those portions of the counties of Oklahoma, Logan, Payne, and Noble lying east of the right of way of the Atchison, Topeka and Santa Fe Railway, or into the Kansas Nation or Osage Nation: *Provided*, That from February 1 to May 5 of each year cattle of said modified quarantined area may be moved into the above-described territory after having been dipped once in Beaumont crude petroleum, or otherwise satisfactorily treated, under the supervision of an inspector of the Bureau of Animal Industry: *And provided further*, That the cattle, after being so dipped or treated, are shipped in clean and disinfected cars and are accompanied by a certificate of dipping or treatment issued by the inspector supervising the same.

No cattle shall be moved or allowed to move from the counties of Oklahoma, Logan, Payne, Cleveland, Pottawatomie, Lincoln, Pawnee, Canadian, that portion of Noble County included in the Otoe and Missouri and Ponca Indian reservations, and that portion of Noble County bounded on the north by the Otoe and Missouri Indian Reservation, on the east by Pawnee County, on the south by Payne County, and on the west by the right of way of the Atchison, Topeka and Santa Fe Railway, that portion of Blaine County south of the Canadian River, that portion of Caddo County north of the right of way of the Chicago, Rock Island and Pacific Railway, that portion of Kiowa County lying north of Comanche County and the line between townships 4 and 5 north, extended westward to its intersection with the North Fork of Red River, nor from the Kansas Nation or Osage Nation, to any portion of the Territory of Oklahoma located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the Territory of Oklahoma; and no cattle from said counties, parts of counties, or localities shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the Territory of Oklahoma which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 6.—TENNESSEE. During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be

moved or allowed to move into the counties of Cannon and Moore, that part of Carroll County lying west of the Huntingdon and Paris road and north of the Huntingdon and Trezevant stage road, and that part of Madison County lying north of the right of way of the Nashville, Chattanooga and St. Louis Railway and west of the right of way of the Illinois Central Railroad, except that portion of said county lying within the corporate limits of the city of Jackson.

No cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Pickett, Overton, Fentress, Putnam, Dekalb, Cumberland, Cannon, Moore, those portions of the counties of Clay and Jackson lying south and east of the Cumberland River, that portion of Roane County lying north of the Tennessee and Clinch rivers, that part of Carroll County lying west of the Huntingdon and Paris road and north of the Huntingdon and Trezevant stage road, and that part of Madison County lying north of the right of way of the Nashville, Chattanooga and St. Louis Railway and west of the right of way of the Illinois Central Railroad, except that portion of said county lying within the corporate limits of the city of Jackson, to any portion of the State of Tennessee located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of Tennessee; and no cattle from the said counties or portions thereof shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Tennessee which is located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 7.—NORTH CAROLINA. During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Yadkin, Mecklenburg, Cabarrus, Cleveland, Polk, Rutherford, Stokes, Forsyth, Davidson, Rockingham, Guilford, and that part of McDowell lying south of the Catawba River and west of the north fork of said river, and that part of Rowan County south and east of the right of way of the main line of the Southern Railway.

No cattle shall be moved or allowed to move from the above-mentioned counties or portions thereof to any portion of the State of North Carolina located outside of the modified quarantined area except during the months of January, February, March, and December of each year, and then only after having been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of North Carolina; and no cattle from the said counties or portions thereof shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of North Carolina which is located outside of the modified quarantine area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 8.—KENTUCKY. During the continuance of the quarantine as herein established and modified, no cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Clinton and Wayne, and that portion of Pulaski County south of the Cumberland River and west of the south fork of the Cumberland River, to any portion of the State of Kentucky located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of Kentucky; and no cattle from said counties, or portion of a county, shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Kentucky which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 9.—ARKANSAS. During the months of January, February, and March of each year, cattle may, after inspection and certification of freedom from ticks (*Boophilus annulatus*) by an inspector of the Bureau of Animal Industry, be moved from the counties of Benton, Washington, Carroll, Madison, Boone, Newton, Marion, Searcy, Baxter, Fulton, Izard, Stone, Sharp, Independence, Randolph, Lawrence, Clay, and Greene to points located outside of the modified quarantined area, for feeding and stocking pur-

poses, subject to the following restrictions, to wit: The cattle shall have been continuously in said counties for not less than thirty days immediately next preceding the date of inspection. Proper facilities shall be afforded for making such inspection. After inspection said cattle shall be moved immediately, without exposure to the infection of splenic or Texas fever direct to pastures or feed lots, without dividing the herd or shipment. The cattle shall be kept continuously in the State into which they are moved for at least three months after arrival. Permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be forwarded.

No cattle from said counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point located outside of the modified quarantined area, unless accompanied by a written permit for the movement from an inspector of the Bureau of Animal Industry.

Exception 10.—OPEN SEASON. During the months of January, November, and December of each year cattle originating in the modified quarantined area shall not be moved from the modified quarantined area for purposes other than immediate slaughter into the States of Missouri and Kansas, the Territories of Arizona and New Mexico, and those portions of California, Texas, Oklahoma, Tennessee, and Georgia not included in the modified quarantined area until the said cattle shall have been inspected, found free of infection, and a written permit for the movement is issued by an inspector of the Bureau of Animal Industry, or by a duly authorized inspector of the State or Territory to which the cattle are destined, nor until permission shall have been obtained from the proper official of the said State or Territory. During the months of January, February, the first fifteen days in March, and the month of December in each year cattle originating in the modified quarantined area may be moved under the above-mentioned restrictions into those portions of the States of Virginia and North Carolina not included in the modified quarantined area.

Cattle originating in and shipped from the modified quarantined area into any State outside of the modified quarantined area other than those States and Territories and portions thereof set out in this exception shall not be moved into or unloaded in transit through any of the States or Territories or portions thereof hereinbefore set out in this exception within three months of the date of the movement from the modified quarantined area.

Cattle which are moved from the modified quarantined area into those States or Territories or portions thereof hereinbefore set out in this exception, under certificates from inspectors either of the Bureau of Animal Industry or of the States or Territories to which the cattle are destined for feeding or stocking purposes, shall not be placed in stock pens which have been reserved for cattle originating in the modified quarantined area.

Exception 11.—VIRGINIA. During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into Campbell County.

No cattle shall be moved or allowed to move from Campbell County to any portion of the State of Virginia located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry, or by a duly authorized inspector of the State of Virginia; and no cattle from Campbell County shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Virginia which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Exception 12.—INDIAN TERRITORY. During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move, except as hereinafter provided, into registration districts Nos. 1, 2, 3, 4, and 5, being that portion of Cherokee Nation bounded on the south by the northern boundary of the Creek Nation and a line extended from the northeast corner of said Creek Nation due east to the Arkansas State line:

Provided, That from February 1 to May 5 of each year cattle of said modified quarantined area may be moved into the above-mentioned registration districts (Nos. 1, 2, 3, 4, and 5) after having been dipped once in Beaumont crude petroleum or otherwise satisfactorily treated under the supervision of an inspector of the Bureau of Animal Industry: *And provided further,* That the cattle after being so dipped or treated are shipped in clean and disinfected cars and are accompanied by a certificate of dipping or treatment issued by the inspector supervising the same.

No cattle from said registration districts shall be moved or allowed to move, except as provided for immediate slaughter, to any point which is located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and a written permit is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

FEEDING STATIONS.

Cattle originating outside of the modified quarantined area which are transported by rail through the modified quarantined area may be unloaded for rest, feed, and water into uninfected pens set apart for such cattle at Polk Stock Yards and Union Stock Yards at Fort Worth, Tex.; the stock yards at Baird, Tex.; the Southern Pacific Railway Stock Yards at Los Angeles, Cal.; the stock yards at Colton, Cal., Bakersfield, Cal., and Salisbury, N. C.; and at the Sapulpa Stock Yards of the St. Louis and San Francisco Railroad at Sapulpa, Ind. T., subject to the following restrictions, to wit:

The cattle shall be free from ticks (*Boophilus annulatus*) and shall not have been unloaded at any point in the modified quarantined area other than the same cars from unloading points named herein. The cattle shall be reloaded into the same cars from which unloaded or into other cleaned and disinfected cars and reshipped as uninfected cattle.

INTERPRETATION.

This rule must be construed in connection with the regulations of the Secretary of Agriculture promulgated May 1, 1905, as amended, and is subject to amendment or revision on statutory notice.

Rule 1, dated May 1, 1905, effective June 1, 1905, and amendment No. 1 to Rule 1, dated September 23, 1905, and effective October 1, 1905, shall cease to be effective on and after February 1, 1906, on and after which date this Revision 1 of Rule 1 shall become and be effective until otherwise ordered.

Done at Washington this twenty-fifth day of January, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT No. 5 TO B. A. I. ORDER No. 125.)

Rules and Regulations for the Inspection of Live Stock and their Products.

U. S. DEPARTMENT OF AGRICULTURE,

OFFICE OF THE SECRETARY,

Washington, D. C., February 14, 1906.

It is hereby ordered, That section 4 of B. A. I. Order No. 125 be and the same is hereby amended by the addition of the following:

Sanitation. (c) Official establishments shall be kept in a clean and sanitary condition. Ceilings, side walls, pillars, partitions, etc., shall, whenever practicable, be frequently whitewashed. Where this is impracticable they shall, when necessary, be washed, scraped, or otherwise effectually cleaned. Likewise all trucks and other receptacles used in moving, mixing, storing, or curing meat or meat products shall be frequently cleaned, and beef carriers or other employees who handle meat in contact with their clothing shall be required to keep such clothing in a sanitary condition. Separate, suitably ventilated, and otherwise sanitary toilet rooms and rooms for the reception of clothing of employees shall be provided and so located that the odors therefrom do not penetrate the rooms or compartments in which meat or meat products are prepared, cured, stored, packed, or otherwise handled. All such rooms or compartments (except the killing floors) shall be provided with cuspidors, and employees who expectorate shall be required to use them.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 15 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Amendment of Certification.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY,
Washington, D. C., February 23, 1906.

In view of the consolidation of the Ohio Poland-China Record Company and the Central Poland-China Record Association the Department has this day recommended to the Secretary of the Treasury that the certification of the following book of record be withdrawn:

American books of record.

HOGS.

Name of breed.	Book of record.	By whom published.
Poland-China	Ohio Poland-China Record ...	Ohio Poland-China Record Company, A. M. Brown, secretary, Dayton, Ohio.

In place of the above the following book of record has been certified:

American books of record.

HOGS.

Name of breed.	Book of record.	By whom published.
Poland-China	National Poland-China Record.	National Poland-China Record Company, A. M. Brown, secretary, Drawer 16, Winchester, Ind.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 6 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and their Products.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., March 5, 1906.

It is hereby ordered, That section 5 of B. A. I. Order No. 125 be, and the same is hereby, amended to read as follows:

5. An ante-mortem examination shall be made of all animals arriving at public stock yards and intended for slaughter at abattoirs at which this Department has established inspection. All animals found upon ante-mortem examination to be affected with any of the diseases or conditions named below shall be rejected, subject to final disposition, and so marked or otherwise rendered identifiable as to facilitate their proper disposition:

- (a) Hog cholera.
- (b) Swine plague.
- (c) Anthrax, or charbon.
- (d) Rabies.
- (e) Malignant epizootic catarrh.
- (f) Pyemia and septicemia.
- (g) Mange, or scab (unless the animals are dipped or otherwise satisfactorily treated).
- (h) Actinomycosis, or lumpy jaw.
- (i) Pneumonia, pleurisy, enteritis, peritonitis, and metritis.
- (j) Texas fever.
- (k) Tuberculosis.
- (l) Hemorrhagic septicemia.
- (m) Blackleg.
- (n) Animals in an advanced stage of pregnancy (showing signs of preparation for parturition) or which have recently (within ten days) given birth to young.
- (o) Any disease or injury which, causing elevation of temperature or affecting the system of the animal, will make the flesh unfit for human food.

(p) Animals too young and immature to produce wholesome meat.

(q) Animals too emaciated and anemic to produce wholesome meat.

Rejected animals for slaughter at an unofficial abattoir shall at once be removed by the owners from the pens containing animals which have been inspected and found to be free from disease and fit for human food, and shall be disposed of in accordance with the laws, ordinances, and regulations of the State and municipality in which said rejected animals are located and, when possible, under the supervision of an inspector of the Department.

When rejected animals are taken to an official establishment for slaughter they shall be accompanied by a permit signed by the inspector in charge of the yards; this permit shall, upon the arrival of the animals at the abattoir, be delivered to the inspector on post-mortem duty at the time, and the animals shall be duly identified by an employee of the abattoir to such inspector on the killing floor before the skins are removed or the carcasses opened for evisceration.

When animals are not inspected in public stock yards the inspector in charge of an establishment, or his assistant, shall carefully inspect all animals about to be slaughtered, and no animal shall be allowed to pass the slaughtering room until it has been so inspected.

Animals rejected when showing signs of preparation for parturition shall not be slaughtered within that period, nor for ten days after parturition. Pregnant and parturient animals may be removed by permit for stock or dairying purposes, except when they are affected with or have been exposed to the contagion of any disease.

JAMES WILSON, *Secretary*.

(AMENDMENT NO. 1 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective from April 16 to May 15, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The provisions of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, are hereby modified in so far as the said revised rule affects the county of Greer, in the Territory of Oklahoma, as follows:

Cattle which have been continuously in Greer County, Okla., for not less than sixty days next preceding the date of this amendment may be moved to any part of the State of Texas during the interval from April 16 to May 15, 1906, inclusive: *Provided*, That such cattle shall have been inspected, found free from ticks (*Boophilus annulatus*), and a written permit for their movement is issued by an inspector of the Bureau of Animal Industry: *And further provided*, That cattle so moved shall be kept continuously in the State of Texas for at least three months after arrival.

Done at Washington this thirteenth day of April, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture*.

(AMENDMENT NO. 2 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective from May 5 to 15, 1906).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The provisions of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, are hereby modified in the following particulars: Cattle in the modified quarantined area which have been dipped once in Beaumont crude petroleum or otherwise satisfactorily treated under the supervision of an inspector of the Bureau of Animal Industry, and which are shipped in clean and disinfected cars and are accompanied by a certificate of dipping or treatment issued by the inspector supervising the same, may be moved from May 5 to 15, 1906, inclusive, into registration districts Nos. 1, 2, 3, 4, and 5, of the Cherokee Nation, Indian Territory.

Done at Washington this thirtieth day of April, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture*.

(AMENDMENT NO. 7 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and their Products.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., May 4, 1906.

It is hereby ordered, That section 16 (c) and section 17 of B. A. I. Order No. 125, rules and regulations for the inspection of live stock and their products, dated June 27, 1904, be, and the same is hereby, amended to read as follows:

16. (c) All packages such as barrels, boxes, firkins, kegs, etc., to be shipped from an official establishment to any foreign country shall have printed or stenciled on the side or on the top, by the packer or exporter, the following:

FOR EXPORT:

- (1) Official number of establishment.
- (2) Number of pieces or pounds.
- (3) Shipping marks.
- (4) U. S. inspected at time of slaughter.

In case said packages are for transportation to some other State or Territory or to the District of Columbia, in place of the words "For export", the words "Interstate trade" shall be substituted. No reference to Federal inspection other than the above statement shall appear on the packages.

17. The inspector in charge of an establishment where Federal inspection is maintained shall cause meat-inspection stamps bearing serial numbers to be affixed to all packages of meat products for which certificates of inspection are required. These stamps shall be designated by the Department, and the cost of them shall be borne by the proprietors of establishments, who shall furnish competent assistants to apply the same under Department supervision. No meat-inspection stamps shall be affixed to packages of meat products which are not accompanied by certificates.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 3 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective from May 5 to 15, 1906).

U. S. DEPARTMENT OF AGRICULTURE,

OFFICE OF THE SECRETARY.

The provisions of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, are hereby modified in the following particulars: Cattle in the modified quarantined area which have been dipped once in Beaumont crude petroleum or otherwise satisfactorily treated under the supervision of an inspector of the Bureau of Animal Industry, and which are shipped in clean and disinfected cars and are accompanied by a certificate of dipping or treatment issued by the inspector supervising the same, may be moved from May 5 to 15, 1906, inclusive, into the Kansas Nation and Osage Nation, Oklahoma Territory.

Done at Washington this fifth day of May, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 46.)

Regulations for the Inspection and Safe Transport of Animals from the United States to Foreign Countries.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., May 15, 1906.

It is hereby ordered, That section 9 (a) of B. A. I. Order No. 46, regulations for the inspection and safe transport of animals from the United States to foreign countries, dated October 21, 1899, be, and the same is hereby, amended to read as follows:

(a) There shall be one attendant for each 35 head of cattle upon steamers having water pipes extending the entire length of both sides of compartments, and upon steamers not so fitted there shall be one attendant to each 25 head of cattle shipped: *Provided, however,* That when all the attendants are experienced and capable men there shall be

one attendant for each 50 head of cattle upon steamers having water pipes extending the entire length of both sides of compartments, and upon steamers not so fitted there shall be one such attendant to each 35 head of cattle shipped.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 8 TO B. A. I. ORDER NO. 125.)

Rules and Regulations for the Inspection of Live Stock and their Products.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., May 16, 1906.

It is hereby ordered, That the first paragraph of section 16 of B. A. I. Order No. 125, rules and regulations for the inspection of live stock and their products, also paragraphs (a) and (b) of said section, be, and the same are hereby, amended to read as follows:

16. All trade labels used on meat food product from inspected carcasses *shall* show the official number of the establishment from which said product came, and also the following statement: "The meat product in this package is from animals which at time of slaughter were inspected and passed for food by U. S. Government inspectors, in accordance with the acts of Congress." The following additional statement *may* also appear upon the trade label if desired by the manufacturer: "Meat from animals which passed U. S. inspection at time of slaughter." No reference to Federal inspection other than the two statements above given shall appear upon any package except as required by paragraph (c) of this section (16) as amended by amendment No. 7 to B. A. I. Order No. 125, dated May 4, 1906. No word or set of words in either statement shall be set in type differing from the rest of the statement or otherwise given special prominence.

(a) A copy of each trade label shall be filed with the Chief of the Bureau of Animal Industry for his inspection and approval, and no trade label which has not been approved by him shall be used upon any inspected meat food product.

(b) When hot branding irons or other instruments are used to imprint hams, bacon, or other product with the name of the packer, or trade-mark, and it is desired in addition to indicate that the meat has been inspected by the Department of Agriculture, the wording for this purpose, which shall be in letters and figures of sufficient size to be legible, shall include the official number of the establishment from which said product came, and also the statement "U. S. Insp'd at slaughter." No other reference to United States inspection shall appear in such branding.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 16 TO B. A. I. ORDER NO. 130.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees—Withdrawal of Certification.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., May 17, 1906.

On account of failure to comply with the provisions of B. A. I. Order No. 130, the certification of the following associations and books of record of pedigrees has been withdrawn and the Secretary of the Treasury informed to this effect:

American books of record.

SHEEP.

Name of breed.	Book of record.	By whom published.
Merino (Delaine).....	Black Top Spanish Merino Sheep Register.	Black Top Spanish Merino Sheep Breeders' Publishing Association, R. P. Berry, secretary, Eightyfour, Pa.

HOGS.

Chester White.....	American Chester White Record.	American Chester White Record Association, Ernest Freigau, secretary, Columbus, Ohio.
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JAMES WILSON, *Secretary.*

(AMENDMENT NO. 4 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenic Fever in Cattle (Effective on and after June 15, 1906).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

It is ordered that Exception 4 of Rule 1, Revision 1, to prevent the spread of splenic fever in cattle, effective on and after February 1, 1906, be and the same is hereby amended to read as follows:

Exception 4.—TEXAS. During the continuance of the quarantine as herein established and modified, no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Baylor and Throckmorton.

No cattle shall be moved or allowed to move from the counties of Childress, Cottle, Hardeman, Foard, Wilbarger, King, Knox, Haskell, Stonewall, Jones, Borden, Howard, Mitchell, Glasscock, Sterling, Irlon, Reagan, Upton, Throckmorton, Baylor, and those portions of the counties of Pecos and Terrell lying north and west of the quarantine line described in Exception 1 of Rule 1, Revision 1, to any portion of the State of Texas located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry, or by a duly authorized inspector of the State of Texas; and no cattle from said counties or parts of counties shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of Texas which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Done at Washington this twenty-sixth day of May, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

Amendment No. 4 to the Regulations of the Secretary of Agriculture Governing the Inspection, Disinfection, Certification, Treatment, Handling, and Method and Manner of Delivery and Shipment of Live Stock which is the Subject of Interstate Commerce—Modification of Regulation 38 (Effective on and after July 1, 1906).

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., June 16, 1906.

The regulations of the Secretary of Agriculture governing the inspection, disinfection, certification, treatment, handling, and method and manner of delivery and shipment of live stock which is the subject of interstate commerce, issued under date of May 1, 1905, effective on and after June 1, 1905, are hereby modified by the revocation of Regulation 38 and the substitution thereof of the following regulation, which revocation shall take effect on July 1, 1906, on and after which date the regulation given below shall become and be effective until otherwise ordered.

Regulation 38.—Cars and other vehicles, yards, pens, sheds, chutes, etc., that have contained diseased sheep shall be cleaned and disinfected in the following manner:

Remove all litter and manure and then saturate the interior surfaces of the cars and the woodwork, flooring, and ground of the sheds, alleyways, and pens with a solution containing 5 per cent of pure carbolic acid, or with a solution containing 2 per cent of cresol. When cresol is used it must be mixed with soft soap in order to render it easily soluble in cold water.

Cars and premises are not required to be cleaned and disinfected on account of their having contained "dipped scabby sheep" that have been dipped within ten days, or sheep that have been exposed to scabies. In determining exposure, all sheep in a flock or shipment in which disease is present shall be considered diseased.

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER No. 136.)

Regulations for the Certification of Associations of Breeders of Purebred Live Stock and Books of Record of Pedigrees.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., June 20, 1906.

In accordance with paragraph 473 of the act of Congress, entitled "An act to provide revenue for the Government and to encourage the industries of the United States," approved July 24, 1897, authorizing the Secretary of Agriculture to "determine and certify to the Secretary of the Treasury what are recognized breeds and purebred animals," as amended by the act of Congress approved March 3, 1903, entitled "An act regulating the importation of breeding animals," the following regulations are hereby prescribed for the certifications of associations of breeders of purebred live stock and books of record of pedigrees:

CERTIFICATION OF AMERICAN ASSOCIATIONS AND BOOKS OF RECORD.**APPLICATION FOR CERTIFICATION.**

1. Any association in the United States desiring certification by the Secretary of Agriculture to the Secretary of the Treasury, under the provisions of paragraph 473 of the act of July 24, 1897, as amended March 3, 1903, shall submit the following:

(a) If incorporated with capital stock, a statement showing amount of capital and number of shares, the names of incorporators, names and residences of directors and officers, names and residences of shareholders, with the amount of stock held by each, and a copy of its charter.

(b) If unincorporated, or if incorporated without stock, a statement showing the names and residences of officers and directors, and the names and residences of members. An association incorporated without capital stock shall submit a copy of its charter.

(c) A statement of the foreign associations with which it is affiliated, with the names and addresses of the custodians of their books of record, a copy of its constitution by-laws and rules of entry, and copies of all blank forms used in the conduct of its business, such as applications for registry, certificates of registry, transfer, etc.; a complete set of the published volumes of its book of record (unless already on file), and a statement of its financial condition on the 30th of June preceding date of application.

REGULATION OF CERTIFIED ASSOCIATIONS.

2. (a) Each certified association shall submit a copy of each volume of its book of record to the Department as soon as published. The Department advises that at least one volume be published annually; however, in cases where circumstances make it impossible to do this, a statement shall be submitted showing how often the book of record will be published, and this statement will be considered. The schedule so adopted shall be adhered to, but the interval allowed between publication of any two volumes shall not exceed four years.

(b) On or before August 1 of each year, each certified association shall submit to the Department a report of its operations during the preceding fiscal year. This report shall include a statement of the number of animals of each sex registered during the year, and the number of imported animals of each sex registered, with the countries from which they were imported; also copies of any changes that may have been made during the year in the constitution and by-laws, rules of entry, or blank forms used by the association in the conduct of its business. Operations during the fiscal year ending June 30, 1906, are partially covered by reports already submitted, and, therefore, a report will not be required on August 1, 1906, but the report for August 1, 1907, shall cover the period of eighteen months from January 1, 1906, to June 30, 1907.

(c) No change shall be made by a certified American association in its rules of entry, constitution, or by-laws concerning the registration of imported animals unless first submitted to and approved by the Department. Changes in the person or place of business of the custodian of the book of record shall be reported without delay.

(d) The report required by the preceding paragraph shall also include a statement of the books of record published during the preceding fiscal year by the affiliated foreign associations. Any changes in the person or place of business of the custodians of such books of record shall be promptly reported to the Department by the secretaries of certified affiliated American associations. The foreign associations with which certified American associations are affiliated are given in paragraph 6 of this order. By the

term "affiliated associations" the Department means an association whose pedigree certificates are accepted for record by a certified American association.

(e) To simplify the methods formerly used to ascertain the pure breeding of animals imported for breeding purposes, the Department has recommended to the Secretary of the Treasury that in all cases where a foreign association is affiliated with a certified American association the certificate of the custodian of the book of record of the latter, and no other, that animals are purebred, of a recognized breed, and duly registered in the books of records established for that breed, shall be accepted by the officers of the customs as sufficient to entitle such animals to free entry.* No such imported animals, certificate of whose registration is to be presented to the customs officers for free entry, shall be registered by a certified American association unless they are purebred, of a recognized breed, and duly registered by one of the affiliated foreign associations in its book of record established for that breed, or from sires and dams so registered, except that registration in Canadian books of record may be recognized where animals so registered trace on both sides to stock registered by a certified foreign association for the same breed, affiliated with a certified American association for that breed. Registration contrary to the provisions of this paragraph of imported animals registered in books of record not included in section 6 of this order, or in one of the amendments to this order, to obtain the duty-free privilege for such animals, will render an association registering such animals liable to withdrawal of certification.

(f) Should any association fail to act in conformity with any or all of these regulations, notice shall be sent at once to such association. Failure to comply within thirty days after sending of such notice, or to submit reasonable explanation for the delay, shall be regarded as sufficient ground for the withdrawal of the certification of the Secretary of Agriculture.

(g) Statements made under the provisions of these regulations shall be under oath by the secretary of each association.

(h) Each association in the United States which has or may have the certification of the Secretary of Agriculture shall hold all its books open to inspection by the proper officer of this Department at any time.

CERTIFICATION OF FOREIGN ASSOCIATIONS AND BOOKS OF RECORD.

3. When a foreign association desires the certification of the Secretary of Agriculture, the custodian of its book of record shall submit to the Department a complete set of the published volumes of such book of record to date of making application, forwarding them to the address given in paragraph 4 of this order. When such foreign association is affiliated with one or more certified American associations, the official indorsement of the custodians of the books of record of the latter shall be shown, stating that such foreign associations register only animals which are purebred and of a recognized breed. The Department reserves the right, however, to be governed in all cases by the advice of representatives of the United States abroad, if the necessity for such a course exists.

4. Custodians of the books of record of certified foreign associations shall submit the volumes of their books of record direct to the Department as soon as published, addressing them to the Chief of the Bureau of Animal Industry, in care of the United States Dispatch Agent, 277 Broadway, New York, N. Y., U. S. A.

OFFICIAL COMMUNICATIONS.

5. All books of record, official papers, reports, and other communications submitted under the provisions of this order should be addressed to the Chief of the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., except as mentioned in the preceding paragraph.

CERTIFIED AMERICAN ASSOCIATIONS AND AFFILIATED FOREIGN ASSOCIATIONS.

6. The following American associations and books of record have been certified to the Secretary of the Treasury on this date. Immediately opposite the names of certified American associations are shown the foreign associations and books of record with which they are affiliated. To obtain the duty-free privilege, certificates of the latter, and no others, except as provided in section 2, paragraph (e), of this order, shall be accepted by American associations for record, subject to proper scrutiny under the provisions of this order.

* Treasury Department orders to this effect become effective on July 1, 1906.

BUREAU OF ANIMAL INDUSTRY—23D REPORT.

American books of record.			Foreign books of record.	
Name of breed.	Book of record.	By whom published.	Book of record.	By whom published.
Aberdeen Angus	American Aberdeen Angus Herdbook.	American Aberdeen Angus Breeders' Association, Thomas McFarlane, secretary, Union Stock Yards, Chicago, Ill.	Polled Herdbook	Polled Cattle Society, Alex. Ramsay, secretary, 9 Old Market place, Bang, Scotland.
Ayrshire	Ayrshire Record	Ayrshire Breeders' Association, C. M. Winslow, secretary, Brandon, Vt.	Ayrshire Herdbook	Ayrshire Cattle Herdbook Society of Great Britain and Ireland, John Howie, secretary, 68 Alloway street, Ayr, Scotland.
Devon	American Devon Record	American Devon Cattle Club, L. P. Sisson, secretary, Newark, Ohio.	Day's Devon Herdbook	Devon Cattle Breeders' Society, John Risdon, Jr., secretary, Wiveliscombe, Somerset, England.
Galloway	American Galloway Herdbook.	American Galloway Breeders' Association, Charles Gray, secretary, Union Stock Yards, Chicago, Ill.	Galloway Herdbook	Galloway Cattle Society, Rev. John Gillespie, secretary, Mounswald Manse, Ruthwell, R. S. O., Dumfriesshire, Scotland.
Guernsey	Herd Register of the American Guernsey Cattle Club.	American Guernsey Cattle Club, William H. Caldwell, secretary, Peterboro, N. H.	English Guernsey Herdbook	English Guernsey Cattle Society, Edwin H. Young, secretary, 12 Hanover square, London, W., England.
Hereford	American Hereford Record	American Hereford Cattle Breeders' Association, C. R. Thomas, secretary, 225 West Twelfth street, Kansas City, Mo.	Guernsey Herdbook	Royal Guernsey Agricultural Society, Henry Currie, secretary, St. Peter's Port, Island of Guernsey.
Holstein Friesian	Holstein Friesian Herdbook	Holstein Friesian Association of America, Frederick L. Houghton, secretary, Brattleboro, Vt.	Herdbook of Hereford Cattle	Hereford Herdbook Society, W. C. G. Britten, secretary, 20 East street, Hereford, England.
Jersey	Herd Register of the American Jersey Cattle Club.	American Jersey Cattle Club, J. J. Hemmingsway, secretary, 8 West Seventeenth street, New York, N. Y.	Friesian Herdbook (Friesch Rundvee-Stamboek)	Friesch Rundvee-Stamboek, D. van Konijnenburg, secretary, Leeuwarden, Holland.
Red Polled	Red Polled Herdbook	Red Polled Cattle Club of America (Incorporated), H. A. Martin, secretary, Gotham, Wis.	North Holland Herdbook (Rundvee-Stamboek 'Nord Holland')	Vereeniging het Rundvee-Stamboek 'Nord Holland', D. Laan, secretary-treasurer, Schellinkhout, Holland.
Shorthorn	American Shorthorn Herdbook.	American Shorthorn Breeders' Association, John W. Groves, secretary, Union Stock Yards, Chicago, Ill.	Jersey Herdbook	Royal Jersey Agricultural Society, John A. Perree, secretary, 8 Church street, St. Helier, Island of Jersey.
Sussex	American Sussex Register	American Sussex Association, Overton Lea, secretary, Nashville, Tenn.	English Herdbook and Register of Jersey Cattle.	English Jersey Cattle Society, John Thornton, secretary, 7 Princes street, Hanover square, London, W., England.
			Red Polled Herdbook	Red Polled Society of Great Britain and Ireland, Albert D. Euren, secretary, Mercury office, Norwich, Norfolk, England.
			Coates's Herdbook	Shorthorn Society of Great Britain and Ireland, E. J. Powell, secretary, 12 Hanover square, London, W., England.
			Sussex Herdbook	Sussex Herdbook Society, W. C. Young, secretary, 191 Fleet street, E. C., London, England.

HORSES.

Belgian Draft	American Register of Belgian Draft Horses.	American Association of Importers and Breeders of Belgian Draft Horses, J. D. Connor, Jr., secretary, Wash. Ind.	Stud Book des Chevaux de Trait Belges.	Société le Cheval de Trait Belge, Chevalier G. Hynderick, secretary, Brussels, Belgium.
Cleveland Bay	American Cleveland Bay Studbook.	Cleveland Bay Society of America, R. P. Stericker, secretary, 90 Chestnut avenue, West Orange, N. J.	Cleveland Bay Studbook	Cleveland Bay Horse Society of Great Britain and Ireland, Thomas Curry, Jr., secretary, Morton Carr, Nunthorpe, E. S. O., England.
Clydesdale	American Clydesdale Studbook.	American Clydesdale Association, R. B. Ogilvie, secretary, Union Stock Yards, Chicago, Ill.	Yorkshire Coach Horse Studbook.	Yorkshire Coach Horse Society of Great Britain and Ireland, Fred Walker, secretary, The Grange, Appletton Roebuck, Bolton Percy, E. S. O., England.
French coach	French Coach Studbook	French Coach Horse Society of America, Duncan E. Willett, secretary, 2112 Michigan avenue, Chicago, Ill. ^a	Clydesdale Studbook	Clydesdale Horse Society of the United Kingdom of Great Britain and Ireland, Archibald MacNellage, secretary, 98 Hope street, Glasgow, Scotland.
Do	French Coach Horse Register.	French Coach Horse Registry Company, Charles C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.	Le Studbook Français, Register des Chevaux de Demi-Sang.	Commission des Studbook des Chevaux de Demi-Sang, Directeur-Général des Haras, Ministère de l'Agriculture, Paris, France, Do.
French Draft	National Register of French Draft Horses.	National French Draft Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.	Studbook des Chevaux de Trait Français.	Société des Agriculteurs de France, M. Henri Johanet, secretary, 8 Rue d'Athènes, France.
German Coach	German, Hanoverian, and Oldenburg Coach Horse Studbook.	German, Hanoverian, and Oldenburg Coach Horse Association of America, J. Crouch, secretary, Lafayette, Ind.	Studbook Percheron de France.	La Société Hippique Percheronne de France, M. A. Thieux, secretary, Nogent-le-Roi, France.
Hackney	American Hackney Studbook.	American Hackney Horse Society, A. H. Godfrey, secretary, P. O. box 111, Madison square, New York, N. Y. ^b	Ostfriesches Stutbuch	Landwirtschaftlichen Hauptverein für Ostfriesland, H. Th. Arjes, secretary, Norden, Germany.
Oldenberg	Oldenburg Coach Horse Register. ^c	Oldenburg Coach Horse Association of America, C. E. Stubbs, secretary, Fairfield, Iowa.	Stutbuch der Münsterländisch-Oldenburgischen Geest.	Zuchtverband des südlichen Zuchtgebietes, J. W. Runge, secretary, Oldenburg, Germany.
Percheron	Percheron Studbook of America.	Percheron Society of America, George W. Stubblefield, secretary, Union Stock Yards, Chicago, Ill.	Oldenburger Stutbuch	Verband der Züchter des Oldenburger eleganten schweren Kutschpferdes, Justus Schüssler, secretary, Rodenkirchen, Oldenburg, Germany.
			Hackney Studbook	Hackney Horse Society, Frank F. Euren, secretary, 12 Hanover square, London, W., England.
			Oldenburger-Stutbuch	Verband der Züchter des Oldenburger eleganten schweren Kutschpferdes, Justus Schüssler, secretary, Rodenkirchen, Oldenburg, Germany.
			Studbook Percheron de France.	La Société Hippique Percheronne de France, M. A. Thieux, secretary, Nogent-le-Roi, France.

^a Address changed to Maple avenue and Harrison street, Oak Park, Ill. ^b Address changed to Tichenor Grand Building, sixty-first street and Broadway, New York, N. Y. ^c Name changed to American Register of Oldenburg Coach Horses.

HORSES—Continued.

Name of breed.	American books of record.		Foreign books of record.	
	Book of record.	By whom published.	Book of record.	By whom published.
Percheron.....	Percheron Register.....	The Percheron Registry Company, Chas. C. Glenn, secretary, 1319 Wesley avenue, Columbus, Ohio.	Studbook Percheron de France.	La Société Hippique Percheronne de France, M. A. Thieux, secretary, Nogent-le-Rotrou, France.
Do.....	The American Breeders and Importers' Percheron Register.	The American Breeders and Importers' Percheron Registry Company, John A. Forney, secretary, Plainfield, Ohio.	.....do.....	Do.
Shetland Pony.....	American Shetland Pony Club Studbook.	American Shetland Pony Club, Mortimer Levering, secretary, Lathayette, Ind.	Shetland Pony Studbook.....	Shetland Pony Studbook Society, Robert R. Ross, secretary, Balmoral Buildings, Aberdeen, Scotland.
Shire.....	American Shire Horse Studbook.	American Shire Horse Association, Chas. Burgess, sr., secretary, Wenona, Ill.	Shire Horse Society Studbook.	Shire Horse Society, J. Sloughgrove, secretary, 11 Chandos street, Cavendish square, London, W., England.
Suffolk.....	American Suffolk Horse Studbook.	American Suffolk Horse Association, Alex. Galbraith, secretary, Janesville, Wis.	Suffolk Studbook.....	Suffolk Horse Society, Fred Smith, secretary, Rendlesham, Woodbridge, Suffolk, England.
Thoroughbred.....	American Studbook.....	The Jockey Club, James E. Wheeler, registrar, 671 Fifth avenue, New York, N. Y.	Australian Studbook.....	W. C. Yullie & Sons, Melbourne, Australia.
			General Studbook.....	Weatherby & Sons, 6 Old Burlington street, London, W., England.
			Le Studbook Français, Register des Cheveaux de Pur-Sang.	Commission des studbook des Cheveaux de Pur-Sang, Directeur-Général des Haras, Ministère de l'Agriculture, Paris, France.
SHEEP.				
Cheviot.....	American Cheviot Sheep Flock Book.	American Cheviot Sheep Society, F. E. Dawley, secretary, Fayetteville, N. Y.	Cheviot Sheep Flock Book.....	Cheviot Sheep Society, John Robson, secretary, Newton, Bellingham, Northumberland, England.
Cotswold.....	American Cotswold Record..	American Cotswold Registry Association, F. W. Harding, secretary, Waukesha, Wis.	Cotswold Flock Book.....	Cotswold Sheep Society, James W. Taylor, secretary, Cold Ashton, Cheltenham, England.
Dorset Horn.....	Continental Dorset Club Record.	The Continental Dorset Club, Joseph E. Wing, secretary, Mechanicsburg, Ohio.	Dorset Horn Flock Book.....	Dorset Horn Sheep Breeders' Association, Thomas H. Ensor, secretary, 64 South street, Dorchester, Dorset, England.
Hampshire Down.....	Hampshire Down Flock Record.	Hampshire Down Breeders' Association of America, Comfort A. Tyler, secretary, Nottawa, Mich.	Hampshire Down Flock Book.	Hampshire Down Sheep Breeders' Association, James E. Rawlence, secretary, 49 The Canal, Salisbury, England.
Leicester.....	American Leicester Record..	American Leicester Breeders' Association, A. J. Temple, secretary, Cameron, Ill.	Leicester Flock Book.....	Leicester Sheep Breeders' Association, W. A. Brown, secretary, Elms Villa, Great Driffield, East Yorkshire, England.
Lincoln.....	National Lincoln Sheep Breeders' Record.	National Lincoln Sheep Breeders' Association, Bert Smith, secretary, Charlotte, Mich.	Lincoln Longwool Sheep Breeders' Flock Book.	Lincoln Longwool Sheep Breeders' Association, William Frankish, secretary, St. Benedict's square, Lincoln, England.

Oxford Down.....	American Oxford Down Record Association, W. A. Shafar, secretary, Hamilton, Ohio.	American Oxford Down Record Book.....	Oxford Down Sheep Breeders' Association, A. F. Milton, Director, b secretary, 11 Queen street, Oxford, England.
Shropshire	American Shropshire Sheep Record.	Shropshire Flock Book.....	Shropshire Sheep Breeders' Association and Flock Book Society, Alfred Mansell & Co., secretaries, College Hill, Shrewsbury, England.
Southdown.....	American Southdown Record.	Southdown Flock Book	Southdown Sheep Society, W. J. Wickison, secretary, 12 Hanover square, London, W., England.
Suffolk	American Suffolk Flock Record.	Suffolk Flock Book	Suffolk Sheep Society, Ernest Prentice, secretary, 64 Oxford street, Ipswich, Suffolk, England.

HOGS.

Berkshire	American Berkshire Record.....	British Berkshire Herdbook.....	British Berkshire Society, Edgar Humfrey, secretary, Shippon, Abingdon, England.
Tamworth.....	American Tamworth Swine Record.	Herdbook of the National Pig Breeders' Association.	National Pig Breeders' Association, John Parr, secretary, Ruddington, Nottingham, England.
Yorkshire	American Yorkshire Record.....	.....do	Do.

DOGS.

Fifty-seven recognized breeds.	American Kennel Club Stud-book.	Kennel Club Studbook.....	Kennel Club, E. W. Jaquet, secretary, 7 Grafton street, Bond street, London, W., England.
		Fox Hound Kennel Studbook.	Masters of Fox Hounds Association, H. E. Preston, editor, Middlethorpe Manor, York, England.
		Greyhound Studbook	National Coursing Club, W. F. Lamont, keeper of the Greyhound Studbook, Windsor House, Bream's Buildings, London, E. C., England.
		Schweizerisches Hundestammbuch.	Schweizerische Kynologische Gesellschaft, Staub, secretary, Zollikon, near Zurich, Switzerland.

^a Address changed to 12 Hanover square, London, W., England.

^b Succeeded by Howard Sammons as secretary, same address.

CATS.

Name of breed.	American books of record.		Foreign books of record.	
	Book of record.	By whom published.	Book of record.	By whom published.
Longhaired (Angora or Persian); Short-haired (Siamese, Manx, Mexican, Abyssinian, Indian, Russian, and Japanese).	United States Register and Studbook (except Appendix).	United States Official Register Association (Incorporated), Mrs. S. Hazen Bond, registrar, 310 First street SE., Washington, D. C.	National Cat Club Studbook and Register.	National Cat Club of England, Doctor Roper, secretary, Beckenham, Kent, England.
Longhaired (Persian or Angora); Short-haired (Russian, Siamese, Japanese, Mexican, Manx, Abyssinian, Native).	Studbook of the American Cat Association.	American Cat Association, Lucy C. Johnson, secretary-treasurer, 5323 Madison avenue, Chicago, Ill.	.....do.....	Do.

CERTIFIED AMERICAN ASSOCIATIONS NOT AFFILIATED WITH FOREIGN ASSOCIATIONS.

7. The following American associations and books of record have been certified to the Secretary of the Treasury on this date. The certificates of their custodians will be accepted by the customs officers in the same manner as those in paragraph 6 of this order :

CATTLE.

Name of breed.	Book of record.	By whom published.
Brown Swiss (Schwytz)	Swiss Record.....	Brown Swiss Cattle Breeders' Association, C. D. Nixon, secretary, Owego, N. Y. Dutch Belted Cattle Association of America, H. B. Richards, secretary, Easton, Pa. Polled Durham Breeders' Association, Fletcher S. Hines, secretary, P. O. Box 445, Indianapolis, Ind.
Dutch Belted.....	Dutch Belted Cattle Herdbook.	
Polled Durham.....	American Polled Durham Herdbook.	

HORSES.

American Trotter	American Trotting Register....	American Trotting Register Association, William H. Knight, secretary, 355 Dearborn street, Chicago, Ill. American Morgan Register Association, H. T. Cutts, secretary, Middlebury, Vt. American Saddle Horse Breeders' Association, I. B. Nall, secretary, Louisville, Ky.
Morgan.....	American Morgan Register	
Saddle Horse.....	American Saddle Horse Register.	

ASSES.

Jacks and Jennets.....	American Jack Stock Studbook.	American Breeders' Association of Jacks and Jennets, J. W. Jones, secretary, Columbia, Tenn.
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SHEEP.

Merino (Delaine).....	Dickinson Spanish Merino Sheep Register.	Dickinson Merino Sheep Record Company, H. G. McDowell, secretary, Canton, Ohio. Improved Delaine Merino Sheep Breeders' Association, George A. Henry, secretary, R. F. D. 8, Bellefontaine, Ohio.
Do.....	Improved Delaine Merino Register.	
Do.....	National Delaine Merino Register.	National Delaine Merino Sheep Breeders' Association, J. B. Johnson, secretary, 248 West Pike street, Canonsburg, Pa.
Merino (French).....	American Rambouillet Record.	American Rambouillet Sheep Breeders' Association, Dwight Lincoln, secretary, Millford Center, Ohio.
Merino (German).....	International Von Homeyer Rambouillet Club Record.	International Von Homeyer Rambouillet Club, E. M. Moore, secretary, Orchard Lake, Mich.
Merino (Spanish)	Register of the Michigan Merino Sheep Breeders' Association.	Michigan Merino Sheep Breeders' Association, E. N. Ball, secretary, Ann Arbor, Mich.
Do.....	Register of the New York State American Merino Sheep Breeders' Association.	New York State American Merino Sheep Breeders' Association, J. H. Earle, secretary, Skaneateles, N. Y.
Do.....	Register of the Ohio Merino Sheep Breeders' Association.	Ohio Merino Sheep Breeders' Association, Wesley Bishop, secretary, R. F. D. 1, Delaware, Ohio.
Do.....	Register of the Standard American Merino Sheep Breeders' Association.	Standard American Merino Sheep Breeders' Association, J. F. Ray, secretary, R. F. D. 3, East Bloomfield, N. Y.
Do.....	Register of the Vermont Merino Sheep Breeders' Association.	Vermont Merino Sheep Breeders' Association, C. A. Chapman, secretary, Middlebury, Vt.

* Succeeded by E. N. Ball, secretary, Ann Arbor, Mich.

HOGS.

Name of breed.	Book of record.	By whom published.
Cheshire.....	Cheshire Herdbook	Cheshire Swine Breeders' Association, Ed. S. Hill, secretary, Freeville, N. Y.
Chester, Ohio Improved.	O. I. C. Record	O. I. C. Swine Breeders' Association, J. C. Hiles, secretary, Cleveland, Ohio.
Duroc Jersey	American Duroc Jersey Record ..	American Duroc Jersey Swine Breeders' Association, T. B. Pearson, secretary, Thorntown, Ind.
Do.....	National Duroc Jersey Record..	National Duroc Jersey Record Association, Robert J. Evans, secretary, Peoria, Ill.
Hampshire (Thin Rind).	American Hampshire Record ..	American Hampshire Swine Record Association, E. C. Stone, secretary, Armstrong, Ill.
Poland-China	American Poland-China Record	American Poland-China Record Company, W. M. McFadden, secretary, Union Stock Yards, Chicago, Ill.
Do.....	National Poland-China Record.	National Poland-China Record Company, A. M. Brown, secretary, Drawer 16, Winchester, Ind.
Do.....	Southwestern Poland-China Record.	Southwestern Poland-China Record Association, H. P. Wilson, secretary, Gadsden, Tenn.
Do.....	Standard Poland-China Record.	Standard Poland-China Record Association, George F. Woodworth, secretary, Maryville, Mo.

CERTIFIED FOREIGN ASSOCIATIONS NOT AFFILIATED WITH AMERICAN ASSOCIATIONS.

8. The following foreign associations and books of record have been certified to the Secretary of the Treasury on this date. Certificates accompanying animals imported for breeding purposes which are registered in these books shall be forwarded by the importer, as soon as possible after the purchase of such animals, direct to the Chief of the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., for examination, and will be mailed to the importer as he directs, immediately after examination :

CATTLE.

Name of breed.	Book of record.	By whom published.
Highland.....	Highland Herdbook	Highland Cattle Society of Scotland, Duncan Shaw, secretary, 42 High street, Inverness, Scotland.
Hollander.....	Ostpreussisches Herdbuch	Herdbuchgesellschaft zur Verbesserung des in Ostpreussen gezüchteten Holländer Rindviehs, J. Peters, secretary, Königsberg, Germany.
Do.....	Westpreussisches Herdbuch....	Herdbuchgesellschaft für Züchtung von Holländer Rindvieh in Westpreussen in Danzig, Franz Rasch, secretary, Zoppot, Germany.
Holsteinische Elbmarsch.	Herdbuch des Viehzucht-Vereins für die Holsteinische Elbmarsch.	Viehzucht-Verein f. d. Holsteinische Elbmarsch, Hofbesitzer J. Bahlmann, secretary, Dorfreihe bei Elmshorn, Germany.
Jeverland	Herdbuch des Jeverländischen Herdbuch-Vereins.	Jeverländer Herdbuch-Verein in Hohenkirchen, Ökonomierat Jurgens, president, Hohenkirchen, Germany.
Kerry and Dexter Kerry.	English Kerry and Dexter Herdbook.	English Kerry and Dexter Cattle Society, F. A. Hordern, secretary, 12 Hanover square, London, W., England.
Norman	Herdbuch de la Race Normande Pure.	M. Delahogue, secretary-treasurer, Caen, France.
Oldenburg	Herdbuch für die Oldenburgischen Wesermarschen.	Oldenburger Wesermarsch-Herdbuch-Verein, Ad. Runge, secretary, Oldenburg, Germany.
Ostfriesischen	Stammbuch Ostfriesischer Rindviehschläge	Verein Ostfriesischer Stammviehzüchter, H. Th. Arjes, secretary, Norden, Germany.
Welsh	Welsh Black Cattle Herdbook..	Welsh Black Cattle Society, James Thomas & Son, secretaries, 9 Victoria place, Haverfordwest, South Wales.

HORSES.

Name of breed.	Book of record.	By whom published.
Hanoverian	Hannoversches Stutbuch.....	Hannoversche Stutbuch-Commission, Freiherr V. Troschke, president, Hannover, Germany.
Holstein Coach.....	Gestutbuch der Holsteinischen Marschen.	Verband der Pferdezüchter in den Holsteinischen Marschen, Johannes Clüver, secretary, Elmshorn, Holstein, Germany.
Trakehnen	Ostpreussisches Stutbuch.....	Landwirthschaftlichen Central-Verein für Litauen und Masuren, Doctor Tolkiehn, secretary, Insterburg, Germany.

SHEEP.

Kent, or Romney Marsh.	Kent, or Romney Marsh Flock Book.	Kent Sheep Breeders' Association, W. W. Chapman, secretary, Room 4, Mowbray House, Norfolk street, Strand, London, W. C., England.
Wensleydale	Wensleydale Blue-faced Sheep Flock Book.	Incorporated Wensleydale Blue-faced Sheep Breeders' Association and Flock Book Society, John A. Willis, secretary, Manor House, Carperby, Aygarth Station, R. S. O., England.
Do.....	Wensleydale Flock Book.....	Wensleydale Longwool Sheep Breeders' Association and Flock Book Society, T. F. King, secretary, Wynbury, Leyburn Yorkshire, England.

9. The word "American" used in this order refers to the United States.

10. This order becomes effective on July 1, 1906.

11. B. A. I. Order No. 130 and amendments thereto are hereby revoked.

JAMES WILSON, *Secretary.*

The law of March 3, 1903, governing the importation of animals for breeding purposes, and amending paragraph 473 of the act of July 24, 1897, is as follows:

Any animal imported by a citizen of the United States specially for breeding purposes shall be admitted free, whether intended to be so used by the importer himself or for sale for such purpose: *Provided*, That no such animal shall be admitted free unless purebred, of a recognized breed, and duly registered in the books of record established for that breed: *And provided further*, That certificate of such record and of the pedigree of such animal shall be produced and submitted to the customs officer, duly authenticated by the proper custodian of such book of record, together with the affidavit of the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree: *And provided further*, That the Secretary of Agriculture shall determine and certify to the Secretary of the Treasury what are recognized breeds and purebred animals under the provisions of this paragraph. The Secretary of the Treasury may prescribe such additional regulations as may be required for the strict enforcement of this provision. Cattle, horses, sheep, or other domestic animals straying across the boundary line into any foreign country, or driven across such boundary line by the owner for temporary pasturage purposes only, together with their offspring, may be brought back to the United States within six months free of duty, under regulations to be prescribed by the Secretary of the Treasury: *And provided further*, That the provisions of this act shall apply to all such animals as have been imported and are in quarantine or otherwise in the custody of customs or other officers of the United States at the date of the passage of this act.

(AMENDMENT NO. 5 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after July 15, 1906).

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture and notice is hereby given that the infectious disease known as splenetic, southern, or Texas fever is not now known to exist, or exists to a slight extent only, among cattle in certain portions of the State of California quarantined by Rule 1, Revision 1, dated January 25, 1906, and effective February 1, 1906.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority of law, do hereby amend Rule 1, Revision 1, to prevent the spread of splenic fever in cattle, in the following particulars, to wit:

First. That part of Exception 1 which describes the quarantine line through the State of California is amended to read as follows:

CALIFORNIA.

Beginning on the Pacific coast where the northern boundary line of San Luis Obispo County connects with the Pacific Ocean; thence easterly along the northern boundary line of San Luis Obispo County to its junction with the western boundary of Kings County; thence northwesterly along the western boundary of Kings and Fresno counties to the northwestern corner of Fresno County; thence northeasterly along the southern boundary of Merced County, and the western, southern, and eastern boundaries of those portions of the Chowchilla and Bliss ranches at present included in Madera County, to the southeastern corner of Merced County; thence continuing northeasterly along the northern boundary of Madera County to the northeast corner thereof; thence southerly and easterly along the eastern boundary lines of Madera, Fresno, and Tulare counties to the southeast corner of Tulare County; thence easterly along the southern boundary line of Inyo County to its intersection with the eastern boundary line of the State of California.

Second. Exception 3 is amended to read as follows:

Exception 3.—CALIFORNIA. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area shall be moved or allowed to move into the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, and Madera. No cattle shall be moved or allowed to move, except as provided for immediate slaughter, from the counties of Kern, Tulare, Kings, San Luis Obispo, Fresno, and that portion of Madera County not at present included in the Chowchilla and Bliss ranches to any portion of the State of California located outside of the modified quarantined area until the said cattle shall have been inspected, found free of infection, and written permission is given by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State of California; and no cattle from said counties and portion of a county shall be moved or allowed to move, except as provided for immediate slaughter, to any point not in the State of California which is located outside of the modified quarantined area, until the said cattle shall have been inspected, found free of infection, and a written permit for the shipment is issued by an inspector of the Bureau of Animal Industry; nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Done at Washington this second day of July, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 137.)

Regulations Governing the Meat Inspection of the United States Department of Agriculture (not including Regulations for Microscopic Inspection of Pork or Regulations Affecting Transportation of Meat in Interstate or Foreign Trade).

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., July 25, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (Public, No. 382), the following regulations are hereby prescribed for the inspection, reinspection, examination, supervision, disposition, and method and manner of handling of live cattle, sheep, swine, and goats, and the carcasses and meat-food products of cattle, sheep, swine, and goats, and for the sanitation of the establishments at which inspection is maintained.

These regulations, which for purposes of identification are designated as B. A. I. Order No. 137, will supersede B. A. I. Order No. 1, dated March 9, 1897, and B. A. I. Order No. 125, dated June 27, 1904, and all amendments thereto, except the portions of the last-named order and amendments which relate to the microscopic inspection of pork, and shall become and be effective at once.

JAMES WILSON, *Secretary of Agriculture.*

GENERAL REGULATIONS.

SCOPE OF INSPECTION.

Regulation 1.—All slaughtering, packing, meat-canning, salting, rendering, or similar establishments whose meats or meat-food products, in whole or in part, enter into interstate or foreign commerce shall have inspection under these regulations unless exempted from inspection by the Secretary of Agriculture. Only farmers, and retail butchers or retail dealers supplying their customers, may be exempted under the law, but they are, nevertheless, subject to the provision of the law which places a penalty upon any person who shall sell or offer for sale or transportation, for interstate or foreign commerce, any meat or meat-food products which are diseased, unsound, unhealthful, unwholesome, or otherwise unfit for human food, knowing that such meat-food products are intended for human consumption.

All carcasses and parts of carcasses of cattle, sheep, swine, and goats, and all meats and meat-food products thereof entering into interstate or foreign commerce shall show either that they have been inspected and passed or that they have been exempted from inspection under these regulations. All meats and meat-food products on hand October 1, 1906, at establishments where inspection has not been previously maintained, or which have been inspected under previously existing law and regulations, shall be examined and labeled under these regulations before being allowed to enter into interstate or foreign commerce.

APPLICATION FOR INSPECTION OR EXEMPTION.

Regulation 2.—The proprietor or operator of each slaughtering, packing, meat-canning, rendering, or similar establishment engaged in the slaughtering of cattle, sheep, swine, or goats, or in the packing, canning, or other preparation of any food product into which the meats or meat-food products of said animals enter in whole or in part, for interstate or foreign commerce, shall make application to the Secretary of Agriculture for inspection or for exemption from inspection. The said application shall be made in writing, addressed to the Secretary of Agriculture, Washington, D. C., and shall state the location of the establishment, the address of the owner or of a duly authorized officer or agent of the same, the kinds of animals slaughtered, the estimated number of animals of any species slaughtered per day and per week, or the estimated amount of meats or meat-food products received from other establishments, and the character, quantity, and proposed disposition of the products of said establishment. Blank application forms will be furnished by the Chief of the Bureau of Animal Industry upon request. If an establishment is not in a sanitary condition, inspection shall not be established.

EXEMPTION FROM INSPECTION.

(a) If, in the judgment of the Secretary of Agriculture, the retail butcher or retail dealer who is engaged in supplying his customers through the medium of interstate or foreign commerce should be exempted from Federal inspection, a certificate of exemption will be furnished to the applicant for use with transportation companies and other companies and persons in securing the movement of his products.

OFFICIAL NUMBER.

Regulation 3.—If inspection is established under said application the Secretary of Agriculture will give said establishment a number by which all its meats and meat-food products shall thereafter be known, and this number shall be used by the inspectors of the Department of Agriculture, and also by the proprietors of said establishment, to mark the meats and meat-food products of the establishment as hereinafter prescribed. Establishments having one or more branches may use the same number for all by affixing a serial letter in connection with the number to differentiate the products of the different branches. Each establishment at which inspection is maintained must be separate and apart from any other establishment engaged in similar business at which inspection is not maintained.

(a) Retail butchers and dealers who have been exempted from inspection under these regulations will be given numbers by which their products will be known.

DESIGNATION OF INSPECTORS.

Regulation 4.—The Secretary of Agriculture will designate an inspector to take charge of the inspection at each establishment where inspection is maintained, and will detail to said inspector such assistants as may be necessary to carry on properly the work of inspection and supervision at said establishment. For the purpose of enforcing the law and

regulations the inspector and all employees under his direction shall have access at all times, by day or night, whether the establishment be operated or not, to every part of said establishment.

OFFICE ROOM.

Regulation 5.—Office room, including light and heat, shall be provided by proprietors of establishments, rent free, for the exclusive use of the inspector and other employees of the Department on duty at each establishment. The room or rooms set apart for this purpose must be properly ventilated, conveniently located, and provided with lockers suitable for the protection and storage of such supplies as may be required; all to meet the approval of the inspector in charge.

ALL CARCASSES AND PRODUCTS INSPECTED.

Regulation 6.—All cattle, sheep, swine, or goats slaughtered at an establishment at which inspection is maintained, and all meats and meat-food products prepared therein, shall be inspected, handled, and prepared as required by these regulations.

NOTICE OF DAILY OPERATIONS.

Regulation 7.—The manager of each establishment at which inspection is maintained shall inform the inspector in charge, or his assistant, when work has been concluded for the day, and of the day and hour when work will be resumed. Under no circumstances shall an establishment be operated except under the supervision of an employee of the Department. All slaughtering must be done within reasonable hours and with reasonable speed, the character of the establishment being considered. Where one inspector is detailed to conduct the work at two or more small establishments where few animals are slaughtered, the inspector in charge may designate the hours for slaughter. No work shall be performed at establishments where inspection is maintained during any day on which such work is prohibited by the law of the State or Territory in which the establishment is located.

BADGES.

Regulation 8.—Each employee of the Department engaged in inspection under these regulations will be furnished with a numbered badge, which he shall wear over the left breast on the outer clothing while in the performance of his official duties, and which shall not be allowed to leave his possession.

BRIBERY.

Regulation 9.—It is a felony, punishable by fine and imprisonment, for any person, firm, or corporation, or any agent or employee of any person, firm, or corporation, to give, pay, or offer, directly or indirectly, to any Department employee authorized to perform any duty under these regulations, any money or other thing of value with intent to influence said employee in the discharge of his duty under these regulations. It is also a felony, punishable by fine and imprisonment, for any Department employee engaged in the performance of duty under these regulations to receive or accept from any person, firm, or corporation engaged in interstate or foreign commerce any gift, money, or other thing of value given with any purpose or intent whatsoever.

SANITATION.

Regulation 10.—Upon receipt of an application for inspection the Secretary of Agriculture will cause to be made an examination of the premises, and will indicate the requirements for sanitation and the necessary facilities for inspection.

Regulation 11.—In order that the carcasses of cattle, sheep, swine, and goats, and the meats and meat-food products thereof, may be admitted to interstate or foreign commerce, it is necessary under the law that the establishments in which the animals are slaughtered or the meats and meat-food products are prepared, cured, packed, stored, or handled shall be suitably lighted and ventilated and maintained in a sanitary condition. All work in such establishments shall be performed in a cleanly and sanitary manner.

(a) Ceilings, side walls, pillars, partitions, etc., shall be frequently whitewashed or painted, or where this is impracticable they shall, when necessary, be washed, scraped, or otherwise rendered sanitary. Where floors or other parts of a building, or tables or other parts of the equipment, are so old or in such condition that they can not be readily made sanitary they shall be removed and replaced by suitable materials or otherwise put in a condition acceptable to the inspector in charge. All floors upon which meats are piled during the process of curing shall be so constructed that they can be kept in a clean and sanitary condition, and such meats shall also be kept clean.

(b) All trucks, trays, and other receptacles, all chutes, platforms, racks, tables, etc., and all knives, saws, cleavers, and other tools, and all utensils and machinery used in moving, handling, cutting, chopping, mixing, canning, or other process, shall be thoroughly cleansed daily if used.

(c) The aprons, smocks, or other outer clothing of employees who handle meat in contact with such clothing shall be of a material that is readily cleansed and made sanitary, and shall be cleansed daily if used. Employees who handle meats or meat-food products shall be required to keep their hands clean.

(d) All toilet rooms, urinals, and dressing rooms shall be entirely separated from compartments in which carcasses are dressed or meats or meat-food products are cured, stored, packed, handled, or prepared. They shall be sufficient in number, ample in size, and fitted with modern lavatory accommodations, including toilet paper, soap, running water, towels, etc. They shall be properly lighted, suitably ventilated, and kept in a sanitary condition. Managers of establishments must see that employees keep themselves clean.

(e) The rooms or compartments in which meats or meat-food products are prepared, cured, stored, packed, or otherwise handled shall be lighted and ventilated in a manner acceptable to the inspector in charge and shall be so located that odors from toilet rooms, catch-basins, casing departments, tank rooms, hide cellars, etc., do not permeate them. All rooms or compartments shall be provided with cuspidors, which employees who expectorate shall be required to use.

(f) Persons affected with tuberculosis or any other communicable disease shall not be knowingly employed in any of the departments of establishments where carcasses are dressed, meats handled, or meat-food products prepared, and any employee suspected of being so affected shall be so reported by the inspector in charge to the manager of the establishment and to the Chief of the Bureau of Animal Industry.

(g) The fattening of hogs or other animals on the refuse of slaughterhouses will not be permitted on the premises of an establishment where inspection is maintained, and no use incompatible with proper sanitation shall be made of any part of the premises on which such establishment is located. All yards, fences, pens, chutes, alleys, etc., belonging to the premises of such establishment shall, whether they are used or not, be maintained in a sanitary condition.

(h) Butchers who dress diseased carcasses shall cleanse their hands of all grease and then immerse them in a prescribed disinfectant and rinse them in clear water before engaging again in dressing or handling healthy carcasses. All butchers' implements used in dressing diseased carcasses shall be cleaned of all grease and then sterilized, either in boiling water or by immersion in a prescribed disinfectant, and rinsed in clear water before being again used in dressing healthy carcasses.

Facilities for such cleansing and disinfection, approved by the inspector in charge, shall be provided by the establishment. Separate trucks, etc., shall be furnished for handling diseased carcasses and parts. Following the slaughter of an animal affected with an infectious disease a stop shall be made until the implements have been cleansed and disinfected unless duplicate implements are provided.

(i) Inspectors are required to furnish their own knives for use in dissecting or incising diseased carcasses or parts, and are required to use the same means for disinfecting knives, hands, etc., that are prescribed for employees of the establishment.

(j) Meats and meat-food products intended for rendering into edible products must be prevented from falling on the floor while being emptied into the tanks by the use of some device, such as a metal funnel.

(k) Plans of new plants and of plants to be remodeled should be submitted to the Secretary of Agriculture.

(l) Carcasses or parts of carcasses inflated with air blown from the mouth shall not be marked "U. S. Inspected and Passed."

(m) Carcasses dressed with skewers that have been held in the mouth shall not be marked "U. S. Inspected and Passed."

INTERPRETATION AND DEFINITIONS OF WORDS AND TERMS.

Regulation 12.—Wherever in these regulations the following words, names, or terms are used they shall be construed as follows:

Inspectors and Department employees.—These terms shall mean, respectively, inspectors and employees of the Bureau of Animal Industry.

"U. S. Inspected and Passed."—This phrase shall mean that the carcasses, parts of carcasses, meats, and meat-food products so marked are sound, healthful, wholesome, and contain no dyes, chemicals, preservatives, or ingredients which render meats or meat-food products unsound, unhealthful, unwholesome, unclean, or unfit for human food.

Rendered into lard or tallow.—This phrase shall mean that the carcasses, parts of carcasses, meats, and meat-food products so designated have been passed for the preparation of lard or tallow only.

"U. S. Inspected and Condemned."—This phrase shall mean that the carcasses, parts of carcasses, and meat-food products so marked are unfit for food and shall be destroyed for food purposes.

Carcass.—This word shall mean an animal that has been killed under these regulations, including all parts which are to be used for food.

Primal parts of carcass.—This phrase shall mean the usual sections or cuts of the dressed carcass commonly known in the trade, such as sides, quarters, shoulders, hams, backs, bellies, etc., and entire edible organs, such as tongues, livers, etc., before they have been cut, shredded, or otherwise subdivided preliminary to use in the manufacture of meat-food products.

Meat-food products.—This term shall mean any product used for food into the composition of which any portion of the carcass enters, or in the preparation of which any portion of the carcass is used, including lard, mince-meat, extracts, gelatin, oleomargarine, butterine, soups, etc.

Vinegar.—The word vinegar, as used herein, shall mean cider vinegar, wine vinegar, malt vinegar, sugar vinegar, glucose vinegar, or spirit vinegar, as defined by the Committee on Food Standards in Circular No. 10, Secretary's Office, United States Department of Agriculture.

ANTE-MORTEM EXAMINATION AND INSPECTION.

Regulation 13.—An ante-mortem examination and inspection shall be made of all cattle, sheep, swine, and goats about to be slaughtered before they shall be allowed to enter an establishment at which inspection is maintained. Said examination and inspection shall be made in the pens, alleys, or chutes of the establishment at which the animals are about to be slaughtered. The proprietors of the establishments at which the said ante-mortem inspection is conducted shall provide satisfactory facilities for conducting said inspection and for separating and holding apart from healthy animals those showing symptoms of disease.

All animals showing symptoms or suspected of being affected with any disease or condition which, under these regulations, would probably cause their condemnation when slaughtered, shall be marked by affixing to the ear or tail a metal tag as provided in Regulation 20.

All such animals, except as hereinafter provided, shall be slaughtered separately, either before regular slaughter has commenced or at the close of the regular slaughter, and shall be duly identified by a representative of the establishment to the inspector on duty on the killing floor before the skins are removed or the carcasses opened for evisceration.

Animals which have been tagged for pregnancy and which have not been exposed to any infectious or contagious disease are not required to be slaughtered, but before any such animal is removed from the establishment the tag shall be detached by a Department employee and returned with his report to the inspector in charge.

(a) If any pathological condition is suspected in which the question of temperature is important, such as Texas fever, anthrax, pneumonia, blackleg, or septicemia, the exact temperature should be taken. Due consideration, however, must be given to the fact that extremely high temperatures may be found in otherwise normal hogs when subjected to exercise or excitement, and a similar condition may obtain to a less degree among other classes of animals. Animals commonly termed "downers," or crippled animals, shall be tagged, as provided for in Regulation 20, in the abattoir pens for the purpose of identification at the time of slaughter, and shall be passed upon in accordance with these regulations.

POST-MORTEM INSPECTION AT TIME OF SLAUGHTER.

Regulation 14.—The inspector or his assistants shall, at the time of slaughter, make a careful inspection of all animals slaughtered. The head, tail, thymus gland, bladder, caul, and the entire viscera, and all parts and blood used in the preparation of meat-food products shall be retained in such manner as to preserve their identity until after the post-mortem examination has been completed, in order that they may be identified in case of condemnation of the carcass. Suitable racks or metal receptacles shall be provided for retaining such parts.

Carcasses and parts thereof found to be sound, healthful, wholesome, and fit for human food shall be passed and marked as provided in these regulations. ^{which} Should any lesion of disease or other condition that would probably render the meat ^{meat} any organ unfit for food purposes be found on post-mortem examination, such meat kept in

or organ shall be marked immediately with a tag, as provided in Regulation 27. Carcasses which have been so marked shall not be washed or trimmed unless such washing or trimming is authorized by the inspector.

DISPOSAL OF DISEASED CARCASSES AND ORGANS.

Regulation 15.—The carcasses or parts of carcasses of all animals which are slaughtered at an establishment where inspection is maintained, and which are found at time of slaughter or at any subsequent inspection to be affected with any of the diseases or conditions named below, shall be disposed of according to the section of this regulation pertaining to the disease or condition. It is to be understood, however, that owing to the fact that it is impracticable to formulate rules covering every case and to designate at just what stage a process becomes loathsome or a disease obnoxious, the decision as to the disposition of all carcasses, parts, or organs not specifically covered by these regulations shall be left to the veterinary inspector in charge. Carcasses found, before evisceration has taken place, to be affected with an infectious or contagious disease, including tuberculosis, shall not be eviscerated at the regular killing bed or bench, but shall be taken to the retaining room or other specially prepared place, separate from other carcasses, and there opened and examined.

(a) *Anthrax, or charbon.*—All carcasses showing lesions of this disease, regardless of the extent of the disease, shall be condemned and immediately tanked, including the hide, hoofs, horns, viscera, fat, blood, and all other portions of the animal. The killing bed upon which the animal was slaughtered shall be disinfected with a 10 per cent solution of formalin, and all knives, saws, cleavers, and other instruments which have come in contact with the carcass shall be treated as provided in Regulation 11, paragraph (h), before being used upon another carcass.

(b) *Blackleg.*—Carcasses of animals showing lesions of blackleg shall be condemned.

(c) *Hemorrhagic septicemia.*—Carcasses of animals affected with this disease shall be condemned.

(d) *Pyemia and septicemia.*—Carcasses showing lesions of either of these diseases shall be condemned.

(e) *Rabies.*—Carcasses of animals which showed symptoms of rabies before slaughter shall be condemned.

(f) *Tetanus.*—Carcasses of animals which showed symptoms of tetanus before slaughter shall be condemned.

(g) *Malignant epizootic catarrh.*—Carcasses of animals affected with this disease and showing generalized inflammation of the mucous membranes shall be condemned.

(h) *Hog cholera and swine plague.*—(1) Carcasses showing well-marked and progressive lesions of hog cholera or swine plague in more than two of the organs (skin, kidneys, bones, or lymphatic glands) shall be condemned.

(2) Carcasses showing slight lesions which are confined to the kidneys and lymphatic glands may be passed.

(3) Carcasses which reveal lesions more numerous than those described for carcasses to be passed, but not so severe as the lesions described for carcasses to be condemned, may be rendered into lard, provided they are cooked by steam for four hours at a temperature not lower than 220° F.

(4) In inspecting carcasses showing lesions of the skin, bones, kidneys, or lymphatic glands due consideration shall be given to the extent and severity of the lesions found in the viscera.

(i) *Actinomycosis, or lumpy jaw.*—(1) If the carcass is in a well-nourished condition and there is no evidence upon post-mortem examination that the disease has extended from a primary area of infection in the head, the carcass may be passed, but the head, including the tongue, shall be condemned.

(2) If the carcass is in a well-nourished condition and the disease has extended beyond the primary area of infection, the disposition shall be made in accordance with the regulations relating to tuberculosis.

(j) *Caseous lymphadenitis.*—When the lesions are limited to the superficial lymphatic glands or to a few nodules in an organ, involving also the adjacent lymphatic glands, and the carcass is well nourished, the meat may be passed after the affected parts are removed and condemned. If extensive lesions, with or without pleuritic adhesions, are found in the lungs, or if several of the visceral organs contain caseous nodules and the carcass is emaciated, it shall be condemned.

(k) *Tuberculosis.*—All carcasses affected with tuberculosis and showing emaciation shall be condemned. All other carcasses affected with tuberculosis shall be condemned, except those in which the lesions are slight, calcified, or encapsulated, and are confined to the tissues indicated in any one of the following five paragraphs, or to a less number of such tissues, and excepting also those which may, under paragraphs (6) and (7) below, be rendered into lard or tallow.

(1) The cervical lymphatic glands and two groups of visceral lymphatic glands in a single body cavity, such as the cervical, bronchial, and mediastinal glands, or the cervical, hepatic, and mesenteric glands.

(2) The cervical lymphatic glands and one group of visceral lymphatic glands and one organ in a single body cavity, such as the cervical and bronchial glands and the lungs, or the cervical and hepatic glands and the liver.

(3) Two groups of visceral lymphatic glands and one organ in a single body cavity, such as the bronchial and mediastinal glands and the lungs, or the hepatic and mesenteric glands and the liver.

(4) The cervical lymphatic glands and one group of visceral lymphatic glands in each body cavity, such as the cervical, bronchial, and hepatic glands.

(5) Two groups of visceral lymphatic glands in the thoracic cavity and one group in the abdominal cavity, or one group of visceral lymphatic glands in the thoracic cavity and two groups in the abdominal cavity, such as the bronchial, mediastinal, and hepatic glands, or the bronchial, hepatic, and mesenteric glands.

(6) Carcasses affected with tuberculosis, in which the lesions of the disease are located as described in any one of the preceding five paragraphs, but are slight and in a state of caseation, or liquefaction necrosis, or surrounded by hyperemic zones, and also those in which slight, calcified, or encapsulated lesions are found in more visceral organs or more groups of visceral lymphatic glands than are specified in any one of the preceding five paragraphs, may be rendered into lard or tallow after the diseased parts are removed. The carcasses shall be cooked by steam at a temperature not lower than 220° F. for not less than four hours.

(7) Carcasses in which the cervical lymphatic glands, one organ, and the serous membrane in a single body cavity, such as the cervical lymphatic glands, the lungs, and the pleura, or the cervical lymphatic glands, the liver, and the peritoneum, are affected with tuberculosis may be rendered into lard or tallow after the diseased parts are removed. The carcasses shall be cooked by steam at a temperature not lower than 220° F. for not less than four hours.

(8) All condemned carcasses, parts of carcasses, or organs showing lesions of tuberculosis shall be deposited in receptacles provided for that purpose, and shall either be tanked at once or be locked in the "condemned" room until such time as an employee of the Department can see that they are placed in the tank.

(9) All heads and other parts showing lesions of tuberculosis shall be condemned.

(1) *Texas fever*.—Carcasses showing sufficient lesions to warrant the diagnosis of Texas fever shall be condemned.

(m) *Parasitic totoero-hematuria*.—Carcasses of sheep affected with this disease shall be condemned.

(n) *Mange, or scab*.—Carcasses of animals affected with mange, or scab, in advanced stages, shall be condemned. When the disease is slight the carcass may be passed.

(o) *Tapeworm cysts*.—Carcasses of animals slightly affected with tapeworm cysts may be rendered into lard or tallow, but extensively affected carcasses shall be condemned.

(p) *Pneumonia, pleurisy, enteritis, peritonitis, and metritis*.—Carcasses showing generalized inflammation of one of the following tissues—the lungs, pleura, intestines, peritoneum, or the uterus—whether in acute or chronic form, shall be condemned.

(q) *Icterus*.—Carcasses showing an intense yellow or greenish-yellow discoloration after proper cooling shall be condemned. Carcasses which exhibit a yellowish tint directly after slaughter, but lose this discoloration on chilling, may be passed for food.

(r) *Uremia and sexual odor*.—Carcasses which give off the odor of urine or a strong sexual odor shall be condemned.

(s) *Urticaria, etc.*—Hogs affected with urticaria (diamond skin disease), *Tinea tonsurans*, *Demodex folliculorum*, or erythema may be passed after detaching and condemning the skin, if the carcass is otherwise fit for food.

(t) *Melanosis, etc.*—Carcasses of animals showing any disease or injury, such as traumatic pericarditis, generalized melanosis, pseudoleukemia, etc., which causes considerable elevation of temperature or affects the system of the animal, shall be condemned.

(u) *Brucises, abscesses, liver flukes, etc.*—Any organ or part of a carcass which is badly bruised or which is affected by malignant tumors, abscesses, suppurating sores, or liver flukes shall be condemned, but when the lesions are so extensive as to affect the whole carcass, the whole carcass shall be condemned.

(v) *Emaciation and anemia*.—Carcasses of animals too emaciated or anemic to produce wholesome meat and those carcasses which show a slimy degeneration of the fat or a serious infiltration of the muscles shall be condemned.

(w) *Pregnancy and parturition*.—Carcasses of animals in advanced stages of pregnancy (showing signs of preparation for parturition), also carcasses of animals which have within ten days given birth to young and in which there is no evidence of septic

infection, may be rendered into lard or tallow if desired by the manager of the establishment; otherwise they shall be condemned.

(x) *Immaturity.*—Carcasses of animals too immature to produce wholesome meat, all unborn and stillborn animals, also carcasses of calves, pigs, kids, and lambs under three weeks of age, shall be condemned.

(y) *Diseased parts.*—In all cases where carcasses showing localized lesions of disease are passed or rendered into lard or tallow, the diseased parts must be removed before the "U. S. Retained" tag is taken from the carcass, and such parts shall be condemned.

(z) *Careless scalding.*—Hogs which have been allowed to pass into the scalding vat alive shall be condemned.

(aa) *Dead animals.*—All animals that die in abattoir pens, and those in a dying condition before slaughter, shall be tagged as provided in Regulation 21, and in all cases shall be condemned. In conveying animals which have died in the pens of the establishment to the tank they shall not be allowed to pass through compartments in which food products are prepared. No dead animals shall be brought into an establishment for rendering from outside the premises of said establishment.

"RETAINING" AND "CONDEMNED" ROOMS.

Regulation 16.—Separate compartments, to be known as "retaining rooms," or other special places for final inspection, shall be set apart at all establishments at which inspection is maintained, and all carcasses and parts marked with a "U. S. Retained" tag shall be held in these rooms pending final inspection. These rooms shall be rat proof and furnished with abundant light; the floors shall be of cement, metal, or brick laid in cement. They shall be provided with facilities for locking, and locks for this purpose will be furnished by the Department. The keys to such locks shall remain in the custody of the inspector or his assistant.

Immediately after the final inspection of carcasses and parts marked with "U. S. Retained" tags is completed, those found to be wholesome and fit for human food shall be released by the veterinary inspector conducting the inspection, who shall remove the "U. S. Retained" tags, and the carcasses shall be removed from the retaining rooms and marked "U. S. Inspected and Passed," as provided in Regulation 28.

The floors and walls of all retaining rooms shall be washed with hot water and disinfected after diseased animals are removed, and before any "retained" animals are again placed therein.

Carcasses or parts of carcasses found on final inspection to be unsound, unhealthful, unwholesome, or otherwise unfit for human food shall be marked "U. S. Inspected and Condemned," as provided in Regulation 28, and shall be removed from the retaining room to the "condemned" room, if not tanked within twenty-four hours.

(a) In each establishment at which condemned carcasses or meat-food products are held for more than twenty-four hours after condemnation, there shall be provided a room entirely separate from all other rooms in the establishment. This room shall be secure and shall be provided with a lock, the key of which shall remain in the custody of a Department employee. This room shall be known as the "condemned room," and shall be kept locked at all times except when condemned meat or meat-food product is being taken into or from the said room under the supervision of a Department employee.

All condemned carcasses shall be removed from retaining rooms within twenty-four hours after they are condemned, except in questionable cases, when they are held pending the decision of the inspector in charge. Condemned carcasses shall not be allowed to accumulate, but shall be removed from the "condemned" rooms, treated with coloring substances, or otherwise treated, as provided in Regulation 18, paragraph (b), and tanked within a reasonable time after condemnation. Carcasses of diseased animals which are eviscerated in the retaining room or in the specially prepared place under the provisions of Regulation 15, shall, unless passed, be removed immediately either to the "condemned" room or to the tank.

Regulation 17—Bruised parts.—When a portion of a carcass is to be condemned on account of slight bruises, which can not be properly removed until the carcass is chilled, the carcass shall be marked with a "U. S. Retained" tag and placed in the retaining room. After chilling, the affected portion shall be cut out, marked "U. S. Inspected and Condemned," and removed to the tank or locked in the "condemned" room, and the remainder of the carcass shall be marked "U. S. Inspected and Passed."

TANKS AND TANKING.

Regulation 18.—All condemned carcasses, parts of carcasses, and meat-food products shall be tanked as follows:

(a) After the lower opening of the tank has been securely sealed by an employee of the Department, and the condemned carcasses, parts, and meat-food products are placed

therein in his presence, the upper opening shall be likewise securely sealed by such employee, whose duty it shall be then to see that a sufficient force of steam is turned into the tank and maintained a sufficient length of time effectually to render the contents unfit for any edible product. Tanks for this purpose shall be so located or operated that the fumes and odors therefrom shall not pervade compartments in which carcasses are dressed or edible products prepared. Wire and lead seals are provided by the Department for sealing tanks.

(b) A sufficient quantity of coloring matter or other substance to be designated by the Department shall be used in connection with the tanking of all condemned carcasses, parts of carcasses, meats, and meat-food products, to destroy them effectually for food purposes.

(c) The seals of tanks containing condemned meats or the tankage thereof shall be broken only by an employee of the Department.

(d) If an establishment where inspection is maintained fails to permit the treatment and tanking of condemned carcasses, parts of carcasses, meats, or meat-food products, as required by these regulations, the inspector in charge shall report that fact to the Department, in order that inspection may be withdrawn from such establishment.

Regulation 19.—Any meats or meat-food products condemned at establishments which have no facilities for tanking shall be treated as provided in Regulation 18, paragraph (b), and removed to an establishment indicated by the inspector in charge and there tanked and rendered under the supervision of an employee of the Department.

LABELS, TAGS, AND BRANDS.

"U. S. SUSPECT" TAG.

Regulation 20.—To the ear or tail of each animal inspected under Regulation 13 which shows symptoms or is suspected of being affected with any disease or condition which, under these regulations, may cause its condemnation on post-mortem inspection, there shall be affixed by a Department employee at the time of inspection a numbered metal tag bearing the words "U. S. Suspect." The employee who affixes the tag shall report the number to the inspector in charge. This "U. S. Suspect" tag shall remain upon the animal until the preliminary post-mortem inspection at the time of slaughter. If no lesions of disease are then discovered the "U. S. Suspect" tag shall be removed and forwarded to the inspector in charge, with a report that the carcass has been inspected and passed, and the carcass shall be labeled or stamped "U. S. Inspected and Passed," as hereinafter provided.

ANTE-MORTEM CONDEMNED TAG.

Regulation 21.—To the ear of each animal which is found in a dying condition or dead on the premises of an establishment at which inspection is maintained there shall be affixed by a Department employee a numbered metal tag bearing the words "U. S. Condemned." The ear bearing the tag shall not be removed from the carcass. The number of this tag shall be reported to the inspector in charge by the employee who affixes it. This tag shall remain on the condemned carcass until it reaches the tank, and immediately before tanking it shall be removed by the Department employee who is supervising the tanking and returned with a report to the inspector in charge.

LABELING BEEF FOR EXPORT.

Regulation 22.—Upon each quarter of each dressed beef carcass inspected and passed for export there shall be placed by a Department employee a meat-inspection label or mark, which shall bear the number of the establishment and the words "U. S. Inspected and Passed."

LABELING BEEF FOR INTERSTATE COMMERCE.

Regulation 23.—Upon each dressed-beef carcass inspected and passed for interstate commerce there shall be placed by a Department employee at the time of inspection at least ten labels or marks bearing the number of the establishment and the words "U. S. Inspected and Passed."

LABELING CANNERS.

Regulation 24.—Upon each quarter of each dressed-beef carcass inspected and passed, and which is to be cut up and prepared in the establishment in which the animal was slaughtered or in another establishment where inspection is maintained, there shall be placed by a Department employee at the time of inspection one label or mark bearing the establishment number and the words "U. S. Inspected and Passed." If, however, a pri-

mal part of any such carcass is to leave the establishment for interstate or foreign commerce, such primal part, or the container thereof, must be labeled, stamped, or branded, under the personal supervision of a Department employee, with the establishment number and the words "U. S. Inspected and Passed."

LABELING CARCASSES OF SHEEP, CALVES, SWINE, AND GOATS.

Regulation 25.—Upon the dressed carcasses of sheep, calves, swine, and goats inspected and passed for interstate or export commerce there shall be placed by a Department employee at the time of inspection at least two labels or marks bearing the number of the establishment and the words "U. S. Inspected and Passed."

STAMP ON CLOTH WRAPPING.

Regulation 26.—When the dressed carcasses or parts thereof of cattle, sheep, calves, swine, or goats are wrapped or inclosed for shipment for interstate or export commerce in burlap, muslin, cheese cloth, or other similar substance, the covering shall bear a meat-inspection stamp or other mark on which shall appear the establishment number and the words "U. S. Inspected and Passed."

"U. S. RETAINED" TAG.

Regulation 27.—Upon each carcass, or part or detached organ thereof, inspected under Regulation 14, in which any lesion of disease or other condition is found that would probably render the meat or any organ unfit for food purposes, there shall be placed by a Department employee at the time of inspection a paper tag, numbered in duplicate, bearing the words "U. S. Retained," attached by a wire and seal. The inspector who attaches this "U. S. Retained" tag shall detach the numbered stub thereof and return it with his report to the inspector in charge. The other portion shall accompany the carcass to the retaining room.

"U. S. CONDEMNED" STAMP.

Regulation 28.—Upon each carcass, or part or detached organ thereof, which is found on final inspection in the retaining room, or other special place for final inspection, to be unsound, unhealthful, unwholesome, or otherwise unfit for human food, there shall be stamped conspicuously by a Department employee at the time of inspection the words "U. S. Inspected and Condemned." In addition the "U. S. Retained" tag shall remain upon the carcass and shall be stamped with the words "U. S. Inspected and Condemned." This stamped "U. S. Retained" tag shall accompany the carcass to the tank and shall be removed immediately before tanking by the Department employee who is supervising that operation, and he shall write or stamp upon the tag the word "Tanked," the date, sign his name, and return the tag with his report to the inspector in charge. If, however, upon final inspection the carcass is passed for food, the inspector shall stamp the retained tag "U. S. Inspected and Passed," and return the tag with his report to the inspector in charge.

MARKING OF PRIMAL PARTS.

Regulation 29.—On each primal part, or organ, or the container thereof, which has been inspected and passed, and which is to leave the establishment for interstate or export commerce, and which has not been theretofore marked with the words "U. S. Inspected and Passed" and the establishment number, there shall be placed, under the personal supervision of a Department employee, a mark, stamp, or brand bearing the words "U. S. Inspected and Passed" and the establishment number. When primal parts or organs are shipped between establishments at which inspection is maintained the number of the establishment need not appear.

BRANDING IRONS.

Regulation 30.—When hot branding irons or other instruments are used to label hams, bacon, or other primal part with the name of the packer, or with a trade-mark, and it is desired, in addition, to indicate that the meat has been inspected by the Department of Agriculture, the wording for this purpose, which shall be in letters and figures of sufficient size to be legible, shall include the number of the establishment in which the product was produced, and also the statement "U. S. Inspected and Passed," or the abbreviated statement "U. S. Ins. Pcd." This marking shall be accepted as the United States inspection mark. It shall be affixed, however, only under the personal supervision of a Department employee.

"SPECIAL" STAMP.

Regulation 31.—Upon all meats and meat-food products prepared for export with preservatives under Regulation 30, paragraph (b), there shall also be stamped or branded,

under the personal supervision of a Department employee, the word "Special." This word "Special" shall not be used upon any inspected meats or meat-food products not prepared under said Regulation 39, unless it is used in combination with other words.

TRADE LABELS.

Regulation 32.—Upon each can, pot, tin, canvas, or other receptacle or covering containing any meat or meat-food product for interstate or foreign commerce, except packages on which meat-inspection stamps appear, there shall be placed, under the supervision of a Department employee, a trade label. This trade label shall contain the words "U. S. Inspected and Passed, under the act of Congress of June 30, 1906," in plain letters and figures of uniform size, the number of the establishment at which the meat or meat-food product is last prepared or packed, and labeled, and the true name of the meat or meat-food product contained in such package. Only trade names which are not false or deceptive may be used upon the trade label. A copy of each trade label shall be filed with the inspector in charge for his approval. The inspector in charge shall approve or disapprove each trade label, and report his action for approval to the Chief of the Bureau of Animal Industry, forwarding the label with his report. Only trade labels which have been approved by the Secretary of Agriculture shall be used.

Regulation 33.—*False or deceptive names.*—No meat or meat-food products shall be sold or offered for sale by any person, firm, or corporation in interstate or foreign commerce under any false or deceptive name; but established trade name or names which are usual to such products and which are not false and deceptive, and which shall be approved by the Secretary of Agriculture, are permitted. Trade labels which are false or deceptive in any particular shall not be permitted. A meat-food product, whether composed of one or more ingredients, shall not be named on a trade label with a name stating or purporting to show that the said meat-food product is a substance which is not the principal ingredient contained therein, even though such name be an established trade name.

TAGGING REINSPECTED MEATS AND MEAT-FOOD PRODUCTS.

Regulation 34.—Upon all meats or meat-food products, which are suspected on reinspection of being unsound, unhealthful, unwholesome, or otherwise unfit for human food, or upon the containers thereof, there shall be placed by a Department employee at the time of reinspection the "U. S. Retained" tags hereinbefore described. The employee who affixes the tag shall send the numbered stub with his report to the inspector in charge. These tags shall accompany the said meats or meat-food products to the retaining room or other special place for final inspection. When the final inspection is made, if the meat or meat-food product be condemned the "U. S. Retained" tag shall be stamped "U. S. Inspected and Condemned," and shall accompany the condemned meat or meat-food product to the tank.

Immediately before the meat or meat-food product is tanked the employee supervising that operation shall write or stamp the word "Tanked" and the date upon the said tag, and sign his name thereto, and forward the tag to the inspector in charge with his report. If, however, upon final inspection the meat or meat-food product is passed for food, the inspector shall stamp the retained tag "U. S. Inspected and Passed," and return the tag with his report to the inspector in charge.

REFERENCE TO UNITED STATES INSPECTION.

Regulation 35.—Except as provided in these regulations, no reference to United States inspection shall appear upon any meat or meat-food product or the container thereof.

REINSPECTION.

REINSPECTION OF PASSED CARCASSES AND PARTS.

Regulation 36.—Before being admitted into any cooking, canning, sausage, or other department of an establishment, also before being packed for shipment, and at such other times as may be deemed necessary, all dressed carcasses or parts thereof that have been previously inspected and passed shall be reinspected by an inspector or his assistants, and if upon any such reinspection any carcass or part thereof is found to have become unsound, unhealthful, unwholesome, or in any way unfit for human food, the original mark, stamp, tag, or label shall be removed or canceled and the carcass or part shall be condemned.

REINSPECTION OF INSPECTED MEATS RECEIVED AT OFFICIAL ESTABLISHMENTS.

Regulation 37.—Except as provided in Regulation 41, only carcasses and parts thereof, meats, and meat-food products which can be identified by marks, seals, brands, or labels be identified

as having been previously inspected and passed by a Department employee shall be taken into or allowed to enter an establishment at which inspection is maintained. All such carcasses, parts, meats, and meat-food products which are brought into one establishment from another, or which are returned to the establishment from which they issued, shall be identified and reinspected at the time of receipt, and shall be subject to further reinspection in such manner and at such times as may be deemed necessary. If upon any such reinspection any carcass or part thereof, or meat or meat-food product, is found to have become unsound, unhealthful, unwholesome, or in any way unfit for human food, the original mark, stamp, tag, or label shall be removed or canceled and the carcass, part, meat, or meat-food product shall be condemned.

(a) Special docks and receiving rooms shall be designated by the establishment for the receipt and inspection of meats or meat-food products, and no meats or meat-food products shall be allowed to enter the establishment by any other docks or receiving rooms, and only in the presence of a Department employee.

MARKING PASSED CARCASSES OR PARTS.

Regulation 38.—All carcasses and parts of carcasses found upon inspection to be sound, healthful, wholesome, and fit for human food which leave the establishment where they are prepared for interstate or foreign commerce shall be designated by a mark, stamp, tag, or label bearing the words "U. S. Inspected and Passed," and no carcass, part of a carcass, or meat-food product which has not been so designated shall be admitted to the canning, sausage, or any other department of any establishment where inspection is maintained other than the establishment in which it was prepared, except as provided in Regulation 41.

DYES, CHEMICALS, AND PRESERVATIVES.

Regulation 39.—(a) No meat or meat-food product for interstate commerce, or for foreign commerce except as hereinafter provided, shall contain any substance which lessens its wholesomeness, nor any drug, chemical, or dye (unless specifically provided for by a Federal statute), or preservative, other than common salt, sugar, wood smoke, vinegar, pure spices, and, pending further inquiry, saltpeter. Inspection and sampling of prepared meats and meat-food products by Department employees shall be conducted in such manner and at such times as may be necessary to secure a rigid enforcement of this regulation.

(b) In accordance with the direction of the foreign purchaser or his agent, meats and meat-food products prepared for export may contain preservatives in proportions which do not conflict with the laws of the foreign country to which they are to be exported.

When such meats or meat-food products are prepared for export under this regulation they shall be prepared in compartments of the establishment separate and apart from those in which meats and meat-food products are prepared according to paragraph (a) of this regulation, and such products shall be kept separate and shall be labeled with special trade labels, approved by the Secretary of Agriculture, and indicating that such products are for export only. Special export certificates will be issued for meats and meat-food products of this character, and, if the products are not exported, under no circumstances shall they be allowed to enter domestic trade.

PREPARATION OF MEATS AND MEAT-FOOD PRODUCTS.

Regulation 40.—All processes used in curing, pickling, preparing, or canning meats and meat-food products in establishments where inspection is maintained shall be supervised by Department employees, and no fixtures or appliances, such as tables, trucks, trays, vats, machines, implements, cans, or containers of any kind, shall be used unless they are clean and sanitary, and all steps in the process of manufacture shall be conducted carefully and with strict cleanliness.

(a) *Cured meats.*—Only meats which bear the mark "U. S. Inspected and Passed," or meats in containers which are so marked, and which upon reinspection are found to be sound, healthful, wholesome, and fit for human food, shall be taken into any meat-curing establishment where inspection is maintained. Any meats which upon reinspection are found to have undergone changes which render them unsound, unclean, unhealthful, unwholesome, or otherwise unfit for human food, shall be condemned and disposed of as provided in Regulation 18.

No drug, chemical, or coloring matter shall be used in any process of curing any meats, except as provided in Regulation 39. All pickling fluids and other solutions or substances used in curing meats must be clean. At the time that cured meats are packed for shipment in interstate or foreign commerce they shall be inspected by a Department employee, and any pieces or portions of such meats which are found to have undergone changes which render them unclean, unsound, unhealthful, unwholesome, or otherwise unfit for human food, shall be condemned and disposed of as provided in Regulation 18.

(b) *Sausage and chopped meats.*—All meat entering a sausage establishment where inspection is maintained shall be inspected by a Department employee when received. No meats which have not been inspected and passed under these regulations at the time of slaughter, or which, having been so inspected and passed, are found upon reinspection by a Department employee to have undergone changes which render them unsound, unclean, unhealthful, unwholesome, or otherwise unfit for human food, shall be employed in the preparation of sausages, chopped meats, or similar meat-food products. Meats or meat-food products which are found to have undergone these changes shall be condemned and disposed of as provided in Regulation 18. All meat trimmings for sausage shall be carefully inspected and assorted under the supervision of employees of the Department. No drug, chemical, preservative, or coloring matter shall be placed in or upon sausages or chopped meats for interstate or foreign commerce, except as provided in Regulation 39. The curing of sausages or chopped meats or similar meat-food products shall be carried out in the manner prescribed for other meats in section (a) of this regulation.

(c) *Canned products.*—All meats or meat-food products entering a canning establishment shall be inspected by a Department employee when received. No meat which has not been inspected and passed at the time of slaughter under these regulations, or which, having been inspected and passed, is reinspected by a Department employee and found to have undergone changes which render it unclean, unsound, unhealthful, unwholesome, or otherwise unfit for human food, shall be allowed to enter into the preparation of canned meats or canned meat-food products. No drug, chemical, or coloring matter shall be used in canned meats or meat-food products for interstate or foreign commerce, except as provided in Regulation 39.

If at any time during the handling of any meat or meat-food product, or at any time after the packing or canning of any such product, any portion or package shall be found to be unwholesome, unhealthful, or otherwise unfit for human food, such portions or packages shall be condemned and disposed of in the manner prescribed in Regulation 18.

No meat-food product which has passed through the various processes of canning shall be removed from the container and recooked, reesterilized, or repacked, except under the supervision and with the approval of a Department employee.

Regulation 41—Rendering of lard and tallow.—The rendering of all fats into lard, tallow, oils, and stearin at establishments where inspection is maintained shall be closely supervised by employees of the Department. All portions of carcasses rendered into lard and tallow must be clean and wholesome. Tanks and vats used for rendering condemned carcasses and refuse products must not be connected in any manner with tanks, vats, or other receptacles used for lard or other edible products. Unmelted fat which is not marked or stamped "U. S. Inspected and Passed" and which upon inspection is found to be sweet, clean, and of healthful appearance may be received, inspected, and rendered at a temperature not lower than 170° F. for one hour.

STAMPS, STAMPING, AND CERTIFICATES.

STAMPS.

Regulation 42.—Numbered meat-inspection stamps shall be affixed to packages containing meats or meat-food products to be shipped or otherwise transported in interstate or foreign trade. No reference to United States inspection other than that contained on the meat-inspection stamp shall appear on any such package.

Regulation 43—Protection for stamps.—Stamps shall be affixed in the following manner, and when they have been affixed they shall be covered immediately with a coating of transparent varnish or other similar substance:

(a) The stamp may be affixed in a grooved space, made by removing a portion of the wood, of sufficient size to admit the stamp.

(b) The stamp may be placed on either end of the package, provided that the sides are made to project at least one-eighth of an inch to afford the necessary protection from abrasion.

Regulation 44—Destruction of used stamps.—Whenever any package of meats or meat-food products bearing the meat-inspection stamp shall have been opened and its contents removed for sale the stamp on said package shall be immediately defaced and destroyed.

CERTIFICATES FOR EXPORTS.

Regulation 45.—The inspector in charge of an establishment shall issue certificates of inspection for all carcasses of cattle, sheep, swine, and goats, and the meats or meat-food products thereof, which are to be exported to foreign countries. Each certificate shall cite the name of the shipper, the name of the consignee, the destination, the establishment number or numbers on the labels, the numbers of the stamps attached to the article to be exported, and the shipping marks. These certificates shall be issued in

serial numbers and in triplicate form. Only one certificate shall be issued for each consignment, unless otherwise directed by the Chief of the Bureau of Animal Industry.

Both the original and duplicate certificates shall be delivered to the exporter. The original is to be attached to the bill of lading accompanying the shipment for the information of the customs authorities, and shall be delivered to the chief officer of the vessel upon which said consignment is to be transported, and continue with the shipment to destination. The duplicate shall be forwarded by the consignor to the consignee, to be used by the latter in identifying the shipment at the point of destination by comparison with the original.

COUNTERFEITING, ETC.

Regulation 46.—It is a misdemeanor, punishable by fine and imprisonment, for any person, firm, or corporation, or officer, agent, or employee thereof, to forge, counterfeit, simulate, or falsely represent, or without authority to use, fall to use, or detach, or knowingly or wrongfully to alter, deface, or destroy, or to fail to deface or destroy, any of the marks, stamps, tags, labels, or other identification devices provided for by law or by these regulations, on any carcasses, parts of carcasses, or the food product, or the containers thereof, or wrongfully to use, deface, or destroy any certificate provided for by law or these regulations.

REPORTS.

Regulation 47.—Reports of the work of inspection carried on in every establishment shall be daily forwarded to the Department by the Inspector in charge, on such blank forms and in such manner as may be specified by the Chief of the Bureau of Animal Industry. The proprietors of establishments at which inspection is maintained shall furnish daily to the Department employees detailed to the various departments accurate information regarding receipts, shipments, and amounts of products on which to base their daily reports.

Weekly reports on sanitation shall be made by the Department employees in charge of the various departments to the Inspector in charge of the station and by the Inspector in charge to the Chief of the Bureau of Animal Industry. If any insanitary conditions are detected by any Department employee, such conditions shall be reported immediately to the Inspector in charge, who, after investigation, shall report them to the Chief of the Bureau.

APPEALS.

Regulation 48.—When the action of any inspector in condemning any carcass or part thereof, meat, or meat-food product is questioned, appeal may be made to the Inspector in charge, and from his decision appeal may be made to the Chief of the Bureau of Animal Industry or to the Secretary of Agriculture, whose decision shall be final.

COOPERATION WITH MUNICIPAL AUTHORITIES.

Regulation 49.—All inspectors in charge are directed to notify the municipal authorities of the character of inspection and to cooperate with such authorities in preventing the entry of condemned animals or their products into the local markets.

The details of any such proposed cooperative arrangement must be first submitted to and approved by the Chief of the Bureau of Animal Industry.

(B. A. I. ORDER No. 138.)

Special Order Providing for the Importation of Canadian Cattle, Sheep, and Swine for Exhibition Purposes at the Michigan State Agricultural Society Fair, Detroit, Mich.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., July 31, 1906.

It is hereby ordered, That Canadian cattle may be imported into the United States for exhibition purposes at the Michigan State Agricultural Society Fair, to be held at Detroit, Mich., from August 30 to September 7, 1906, without being subjected to the tuberculin test, provided they are accompanied by a certificate issued by a Canadian official veterinarian, stating that such cattle are free from contagious and infectious diseases: *And provided further,* That the cattle which are not sold to remain in the United States shall be returned immediately to Canada at the close of said fair.

The Department must be notified of any Canadian cattle which will remain in the United States, and the tuberculin test will be applied to them by an inspector of this Department before shipment to destination is allowed.

All Canadian cattle, sheep, and swine intended for this agricultural fair must be shipped directly to the agricultural fair grounds and must not be unloaded in any public stock yards.

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 2 TO RULE 2.)

To Prevent the Spread of Scabies in Cattle (Effective on and after September 15, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the contagious and communicable disease known as scabies is not now known to exist, or exists to a slight extent only, among cattle in certain States and parts of States and Territories quarantined by Rule 2, dated May 1, 1905, and effective June 1, 1905.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, do hereby remove and revoke the quarantine placed by Rule 2 upon the following area, to wit:

The States of WASHINGTON and OREGON; all that part of the State of MONTANA lying west of the western boundary line of the county of Teton and south of the southern boundary lines of the counties of Teton, Chouteau, and Dawson; all that part of the State of WYOMING lying north of the northern boundary lines of the counties of Converse and Natrona, and west of the western boundary lines of the counties of Natrona and Carbon; all that part of the State of COLORADO lying west of the summit of the Medicine Bow Range of mountains in Larimer County, the west line of Boulder, Gilpin, Jefferson, Teller, Custer, Huerfano, and Las Animas counties; and also that part of COLORADO lying west of the Ninth Guide Meridian West in Fremont County; all that part of the Territory of New Mexico lying west of the western boundary lines of the counties of Colfax, Mora, San Miguel, and Guadalupe to the point where the roadbed of the El Paso and Rock Island Railway crosses the western boundary line of Guadalupe County; and also that part of the Territory of NEW MEXICO lying west and north of the rights of way of the El Paso and Rock Island and the El Paso and Northeastern railways in the counties of Torrance, Lincoln, and Otero; all that part of the State of TEXAS lying south of the southern boundary lines of the counties of Andrews, Martin, Howard, Mitchell, Nolan, and Taylor, and east of the 100th meridian of longitude west of Greenwich, except the counties of Nueces, Cameron, and Hidalgo; all of the Territory of OKLAHOMA except the counties of Woodward and Beaver; all that part of the State of KANSAS lying east of the western boundary lines of the counties of Barber, Pratt, Stafford, Barton, Russell, Osborne, and Smith; all that part of the State of SOUTH DAKOTA lying east of the Missouri River; all that part of the State of NORTH DAKOTA lying east of the western boundary lines of the counties of Dickey, Lamoure, Barnes, Griggs, Nelson, McHenry, and Bottineau, and north of the southern boundary lines of the counties of Benson, Pierce, and McHenry.

Amendment No. 1 to Rule 2 is hereby revoked, such revocation to take effect on and after September 15, 1906, on and after which date this amendment shall become and be effective until otherwise ordered.

Done at Washington this thirtieth day of August, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 1 TO B. A. I. ORDER NO. 137.)

Regulations Governing the Examination and Relabeling of Meats and Meat-Food Products on Hand.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., September 7, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for

human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (Public, No. 382), the following regulations are hereby prescribed for the examination and labeling of meats and meat-food products on hand October 1, 1906, which have not been inspected under the act of Congress of June 30, 1906.

These regulations, which for purposes of identification are designated as Amendment No. 1 to B. A. I. Order No. 137, shall become and be effective at once.

JAMES WILSON, *Secretary of Agriculture.*

INSPECTION AND RELABELING OF MEATS AND MEAT-FOOD PRODUCTS ON HAND.

Regulation 50.—(a) Stocks of meat and meat-food products on hand which are to enter interstate or foreign commerce on or after October 1 next, and which have not been inspected under the act of Congress of June 30, 1906, will be inspected upon application directly to the Chief of the Bureau of Animal Industry or to him through the inspectors in charge of the various stations.

COLLECTION OF SAMPLES.

(b) The inspector in charge at the point from which such application is made, or to whom the application may be referred, will, upon direction of the Chief of the Bureau, cause samples to be collected by an officer designated by him.

(c) The collector shall personally select at random cans, packages, or portions of each different lot of meat or meat-food products which is to enter interstate or foreign trade, note being made at the time whether the samples are for one or the other, and, in the case of foreign shipments, for what country the products are intended. He shall at the same time note the number of packages or pieces of each lot and require that these be kept separate and undisturbed until the examination is finished. The samples in each case should consist of at least one-half pound of the material to be examined.

(d) The collector shall record on a slip provided for that purpose full data concerning each sample, and each sample must be given a serial number to which is prefixed the name of the city of collection. The data should include name of product (as it appears upon the label if labeled), the name of the manufacturer, the name of the establishment from which the sample is taken, the date of collection, and the number of packages in each lot. When this is done there must be attached to each sample a card or sticker bearing the serial number of the sample as recorded on the collector's sample slip, the collector's initial, and any other data that may be deemed desirable. If more than one collector be employed, a letter should be assigned to each, the collector's letter to be affixed to the number in each case, for example: Collector A—Samples, Chicago 1A, Chicago 2A, Chicago 3A, etc. Collector B—Samples, Chicago 1B, Chicago 2B, Chicago 3B, etc.

(e) In cities where the Department has no laboratory the samples collected should be numbered and recorded in the manner described above, prefixing to the number of the sample the name of the city in which collection was made, e. g., Milwaukee 1A, St. Louis 5A, St. Louis 7B. These samples should then be forwarded with their appropriate records, by mail or express, to the inspector in charge of a station at which a laboratory is located. They will be analyzed and reported on in the manner hereinafter described and the original record card returned by the inspector in charge in the laboratory city to the inspector in charge in the city of collection.

EXAMINATION AND ANALYSIS OF SAMPLES.

(f) After the samples have been recorded and numbered they must be delivered by the collector to the analyst, or else placed in some designated compartment to which only the analyst and the collector have access. In no case must the samples leave the possession of the analyst until the analysis is completed.

(g) The analyst must record the details of the examination in books or on cards provided for that purpose, and must return to the inspector in charge a report on cards prepared for that purpose. These cards should show the presence or absence of preservatives or coloring matters not permitted by the regulations. In case any preservative or coloring matter prohibited by the regulations is found, the particular preservative or coloring matter must be stated.

(h) When a sufficient number of samples have been examined to establish the wholesomeness of a certain brand, inspectors will be so advised.

LABELING AND MARKING.

(4) Upon receipt of the report from the analyst the inspector in charge shall permit those lots of meat or meat-food products found free from foreign coloring matters or preservatives to be correctly relabeled (if improperly labeled) in accordance with this regulation, under the supervision of a Department employee, care being taken to see that only the packages which were contained in the lot at the times the samples were taken are relabeled. Where the analysis shows the presence of substances not permitted by the regulations, the lots of goods from which such samples were taken shall not be relabeled or marked as provided for in this regulation, nor shall meats or meat-food products which are falsely labeled as to the kind of meat entering into their composition be relabeled until their trade designation is made to conform with their constituents.

(j) Sweet pickled, dry salted, smoked, and other similar meats shall be inspected, and if found to be clean, healthful, wholesome, and free from any condition contrary to the regulations governing the meat inspection of the United States Department of Agriculture, they shall be labeled or marked as provided in paragraph (k) of this regulation.

(k) For the purpose of marking products inspected under this regulation an inspection stamp shall be furnished by the Department reading as follows: "U. S. Inspected and Passed under Regulation 50." When necessary a rubber stamp will be issued in lieu of the paper stamp. One label upon an unopened case or package of canned meats shall be considered sufficient.

MEDICAL MEAT PRODUCTS.

Regulation 51.—Products such as meat juice, meat extract, etc., which are intended only for medicinal purposes and are advertised only to the medical profession, are not considered meat-food products within the meaning of B. A. I. Order No. 137 and this amendment.

Instructions Concerning Trade Labels Under the Meat-Inspection Law and Regulations.

WASHINGTON, D. C., September 12, 1906.

TO INSPECTORS AND OTHERS:

The following instructions are intended, so far as possible, to cover the interpretation of the meat-inspection law regarding trade labels, and include tentative rulings made by the Pure Food Commission under the pure-food law. These tentative rulings of the Pure Food Commission are made known at this time by the Bureau of Animal Industry in order that labels for meat-food products may be prepared in conformity with both laws.

The essential features of a label must be placed together in any desired order without interspersing any descriptive, qualifying, or advertising matter. The essential features are as follows:

The true name of the product.

The true name of the manufacturer, if given.

The true name of the place of manufacture, if given.

The name of the manufacturer is not required under the meat-inspection or pure-food laws, but if given it must be the true name.

Persons, firms, or corporations owning subsidiary companies having legal entity may use the names of such companies, provided application has been made for inspection and it has been granted. The inspection legend in such case to bear the establishment number of the parent firm or corporation.

The name of the place of manufacture, other than the establishment number embodied in the inspection legend, is not required under the meat-inspection law. The name of the place of manufacture is not required under the pure-food law, except in the case of compounds, mixtures, imitations, or blends.

The inspection legend "U. S. Inspected and Passed under the act of June 30, 1906," and the establishment number in plain characters of uniform size, which shall be in proportion to the general lettering of the label, must be separately and prominently embodied in all trade labels, except that until December 31, 1906,* the supply of trade labels now on hand, which bear no false or deceptive names of the product in the container labeled, may be used, provided that the present reference to inspection thereon is obliterated and a sticker approved by the inspector in charge and bearing the statement

* Under date of December 10, 1906, this provision was extended until October 1, 1907.

"U. S. Inspected and Passed under the act of June 30, 1906," and the establishment number is firmly affixed to the package in connection with the label used.

In the case of meats contained in cartons, or in wrappers of paper, cloth, or other similar substance, the inspection legend and establishment number may be embodied in a sticker or seal of proportionate size, prominently displayed with the trade label, but not necessarily a part of the trade label, such stickers or seals to be approved by the Department of Agriculture. When a package is fastened by a seal or other device, embodying the establishment number and the inspection legend, such seal shall also be approved by the Department.

The wording of all trade labels and the inspection legend embodied therein, and the wording on stickers or seals, must be in English, except that, if so desired, the name of the product may be inserted also in a foreign language as an explanation or translation of the English name; for example, "Loin Roll" or "Lachschinken."

Export labels and brands.—While labels to be affixed to goods for foreign shipment may be printed in a foreign language, the same rules shall apply with reference to false labeling and naming of ingredients as shall apply to goods prepared for domestic use. The meat-inspection law does not require boxes or barrels, except such as contain lard, to be stenciled or labeled, as these containers will be marked with an inspection stamp; but if they are labeled or stenciled it must be in accordance with the rules pertaining to labeling and stenciling domestic meat-food products. The inspection legend and establishment number must in all cases appear in English; but if desired they may, literally translated, appear in the language of the country to which the package is destined.

False or deceptive names.—No picture, design, or device which gives any false indication of origin or quality shall be used upon any label. Any statement, design, or device regarding the virtues or properties of the materials contained in the package that is false in any particular is prohibited by law; for example, the picture of a pig appearing on a label which is placed upon beef product; the picture of a chicken appearing upon a label placed upon product composed of veal or pork; the picture of a leaf or leaves appearing in connection with the word "Lard" is considered deceptive, except that when used on packages containing leaf lard it may appear separately from the word "Lard" as a brand; e. g., "Maple Leaf Brand." Such words as "Special," "Superior," "Fancy," "Selected," etc., placed upon products which are more inferior than implied by the term used are false and deceptive.

Geographical names.—Geographical names may be used only with the words "Cut," "Type," "Brand," or "Style," as the case may be, except upon foods produced or manufactured in the place, State, Territory, or country named; for example, "Virginia Ham" not produced in Virginia must be marked "Virginia Style Ham;" "English Brawn" must be "English Style Brawn;" "English Sausage" should be "English Style Sausage;" "Bologna Sausage" should be "Bologna Style Sausage;" "Frankfurter Sausage" should be "Frankfurter Style Sausage;" "Cumberland Middles" should be "Cumberland Cut Middles;" "Winchester Sausage" or "Winchester Ham" should be "Winchester Brand Sausage" or "Winchester Brand Ham," etc.

Names of breeds of live stock and names of persons.—Names indicative or imitative of distinctive types or breeds of live stock can not be used unless the product is actually made of the meat from animals of those breeds; for example, "Berkshire Pork" can not be used unless the product is from the Berkshire breed of hogs.

Names of persons when used as brands or applied to cuts will not be considered deceptive.

Products prepared for another establishment.—When an article is prepared by an establishment for another firm or individual, if the name of the said firm or individual is to appear upon the label, the statement must be made that the article was "prepared for" or "manufactured for" the firm or individual. Names of subsidiary companies which have legal entity may be used without the prefix "prepared for" or "manufactured for;" and such subsidiary companies must make application for inspection under the establishment number of the parent organization. The name of a firm or individual may appear as the distributor of the product.

Ham.—The word "Ham" without a prefix indicating the species of animal is considered to be a pork ham. Trimmings removed from the ham and used in the preparation of potted or prepared meats or sausage, or when used alone, may be known as "Potted Ham" or "Ham Sausage." The word "Ham" can not be used on any prepared ham product without some word clearly and truthfully indicating the method of preparation; thus, "Potted Ham," "Devilled Ham," "Minced Ham," "Ham Sausage."

Tongue.—No species of animal need be indicated; but if the species is specified, the statement must be true. In connection with the preparation of tongue products, the rulings will be the same as those in connection with the preparation of ham products; for example, "Potted Tongue" must be made of tongue or tongue trimmings.

EXAMPLES.

HAM, TONGUE, SHOULDER, ETC.

Potted, Deviled, Minced, or otherwise prepared Ham.—Name considered false or deceptive unless product is actually made of ham or ham trimmings. If any other pork is used the mixture can be called "Pork Meats" or "Potted Meats."

Potted, Deviled, Minced, or otherwise prepared Tongue.—Must be made only of tongue or tongue trimmings.

Picnic Hams.—Can not be called "Hams;" may be called "Picnics" or "Picnic Shoulders."

California or Cala Hams.—Can not be called "Hams;" may be called "Calas."

Boneless Hams, as applied to shoulder butts.—May be called "Boneless Picnics" or "Boneless Butts."

Cottage Hams.—May be called "Cottage Style Ham Sausage," if made from ham or ham trimmings.

Dewey Ham.—Is a loin. May be called "Dewey Loin;" can not be called "Ham."

Westphalia Ham.—May be called "Westphalia Style Ham."

York Ham.—May be called "York Cut Ham" or "York Style Ham."

New York Shoulder.—May be called "New York Style Shoulder."

English Cured Ham.—May be called "English Style Cured Ham."

SAUSAGE.

Pork Sausage.—Can not be so called unless made from pork meat only.

Little Pig Sausage.—May be called "Little Pork Sausage" or "Pigmy Sausage."

Farm Sausage.—Call "Farm Style Sausage."

Bologna Sausage.—Call "Bologna Style Sausage."

Oxford Sausage.—Call "Oxford Style Sausage."

Vienna Sausage.—Call "Vienna Style Sausage."

Frankfurt Sausage or Frankfurter Sausage.—Call "Frankfurt Style Sausage" or "Frankfurter Style Sausage."

Liver Sausage or Blood Sausage.—Names of other ingredients must be shown.

LARD, ETC.

Pure Lard.—Must be made of sweet, clean, clear hog fat. The addition of not to exceed 5 per cent of clean, sweet lard stearin is allowed.

Leaf Lard.—Must be made wholly from leaf fat of hogs, without the addition of fat from any other portion of the carcass.

Kettle Rendered Lard.—Must be actually rendered in an open or closed kettle, without the addition of pressure or contact of live steam with the product.

Open Kettle Rendered Lard.—Must be actually rendered in an open kettle, as above.

Country Lard.—Must be made in the country in an open kettle; can be called "Country Style Lard," if rendered in an open kettle.

Home Made Lard.—Call "Home Made Style Lard."

Lard Compound.—The pure lard must be equal to or greater than any other one ingredient.

OTHER PRODUCTS.

Roast Beef or Roast Mutton.—May be used provided a description of the method of preparation appears in letters of prominent size in connection with the words "Roast Beef" or "Roast Mutton."

Rump Steak.—Can not be so called unless made from rump steak only.

Minced Steak.—Clearly a misnomer, unless made from steaks.

Braten.—Can not be so called unless made from pork only.

Veal Loaf.—Can not be so called unless the meat used is veal only.

Extract of Beef.—Must be actually made from beef.

Mixtures and Compounds.—Mixtures, when the name plainly indicates a mixture, such as "Sausage," "Hash," "Mince," etc., need not be marked "Compound." Other mixtures not so indicated by their names must be marked "Compound." In the case of compounds containing lard, stearin, or other fats, or cotton-seed oil, and in compounds containing stearin and cotton-seed oil, the names of the ingredients must appear upon the label. If the compound has a distinctive name, such as "White Cloud," "Cottolene," "Cottosuet," etc., the word "Compound" need not appear, but the ingredients must be stated upon the label. When the word "Compound" is used it can not be qualified by any adjective either before or after, nor can the name of any product be attached to the word "Compound," unless that product is the principal ingredient of the compound.

Unless mince-meat, or pork and beans, or soups contain a considerable proportion of meat, they will not be considered meat-food products.

Sausages and Chopped Meats.—The word "Sausage" without a prefix indicating the species of animal is considered to be a mixture of minced or chopped meats, with or without spices. If any species of animal is indicated, as "Pork Sausage," the sausage must be wholly made from the meat of that species. If any flour or other cereal is used, the label must so state. If any other meat product is added the label must so state; for example, "Pork and Beef Sausage;" "Pork, Beef, and Flour" (or other cereal); or "Pork and Beef Sausage, Cereal Added."

Meat loaves, without a prefix indicating any particular kind of meat, are held to be mixtures of meats, flour (or other cereal), milk, eggs, butter, or other ordinary loaf ingredients. If any particular kind of meat is indicated, that kind must be the only meat used; for example, "Veal Loaf" must be made from veal and loaf ingredients only. If any other meat is used, the label must so state; for example, "Veal and Pork Loaf;" "Veal, Beef, and Pork Loaf."

The word "Paté" is synonymous with "Loaf."

Flour or other cereals may be used in the preparation of loaves, gravies, or soups without being stated on the label.

Canned Products.—If flour or other cereal is used in any canned product which is not labeled "Loaf," "Paté," or "Soup," or which is not prepared with gravy, the label must clearly show the presence of the flour or other cereal.

LARD, LARD COMPOUNDS, AND LARD SUBSTITUTES.

All tins, pails, tierces, or other true containers of lard, lard compounds, or lard substitutes must be so marked as to clearly indicate the ingredients from which made.

Leaf Lard.—Leaf lard must be made from the leaf fat only, and no other part of the hog fat can be added thereto.

Kettle Rendered Lard.—Kettle rendered or kettle lard may be rendered in either open or closed kettles, not under pressure, and no live steam must come in contact with the product. When labeled "Open Kettle Rendered," it must be rendered in an open kettle.

Lard and Lard Stearin.—Pure lard, made from sweet, clear, and clean hog fat to which not to exceed 5 per cent of pure, sweet lard stearin has been added, may be labeled "Pure Lard." If lard contains more than 5 per cent of added lard stearin, or any per cent of other stearin, the addition must be so stated on the label, with the name of the kind of stearin used; for example, "Pure Lard with Lard Stearin Added," or "Pure Lard with Oleo Stearin Added," or "Lard with Oleo Stearin Added," or "Lard with Tallow Added." When the word "Pure" is used in connection with the word "Lard," the lard must be made only from sweet, clean, clear hog fat. In all such cases the lard must equal or exceed in quantity the added animal fat. The words "Pure Lard with ----- Added" can not be used when any ingredient other than pure, clean animal fat is added. The percentage of added stearin or other animal fat may be given if desired.

Lard Compounds.—A substance composed of lard, stearin, or other animal fat and a vegetable oil may be labeled "Lard Compound," but in such case the names of all the ingredients must be shown upon the label; and in all cases the proportion of lard must be equal to or greater than any other one of the ingredients.

Compounds, or Lard Substitutes.—In compounds or lard substitutes, if the compound has a distinctive name, the distinctive name may be used without the word "Compound," and in all cases the ingredients must be stated on the label. In all cases only sweet and clean edible stearin and sweet and clean edible fats shall be used.

The prepuces, bladders, etc., shall not be used in edible food products.

Manufacturers are warned that the above rulings do not exempt them from the enforcement of State laws.

A. D. MELVIN, *Chief of Bureau.*

Approved:

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 7 TO B. A. I. ORDER NO. 109.)

Regulations for the Inspection and Quarantine of Horses, Neat Cattle, Sheep, and other Ruminants, and Swine Imported into the United States.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., September 15, 1906.

It is hereby ordered, That paragraph 1 of the regulations for the inspection and quarantine of animals imported into the United States issued under date of April 10, 1903 (B. A. I. Order No. 109), be, and is hereby, amended by the addition of Lowellton, Me.

(port of Bangor, Me.), as an animal quarantine station during the months of September, October, and November, 1906, for the inspection and quarantine of animals imported into the United States. This order to terminate November 30, 1906.

JAMES WILSON, *Secretary*.

(AMENDMENT No. 2 TO B. A. I. ORDER No. 137.)

Regulations Governing the Transportation of Meat in Interstate and Foreign Commerce.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., September 17, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following regulations are hereby prescribed for the transportation in interstate and foreign commerce of the carcasses, parts of carcasses, and meat-food products of cattle, sheep, swine, and goats.

A meat-food product, within the meaning of the meat-inspection act and of these regulations made thereunder, is considered to be any article intended for human consumption which is derived or prepared from any portion of the carcass of cattle, sheep, swine, or goats, and which, when eaten, is capable of supplying nourishment or energy to the human body, or of repairing body waste. A mixture of which meat is an ingredient will not be considered a meat-food product unless the meat contained therein is a definite and considerable portion of the said mixture, and Regulation 12 of B. A. I. Order No. 137 is hereby modified accordingly. But where such a mixture is prepared in an establishment where inspection is maintained, the sanitation of that portion of the establishment in which the said mixture is prepared will be supervised by the Department, and the meat or meat-food product which enters the said mixture will be inspected before it enters the said mixture. The mixture will not be officially labeled. Mixtures such as mince-meats, soups, etc., which come under this ruling and which are not officially labeled, are allowed in interstate and foreign commerce without inspection and without certificates, subject to the provisions and requirements of the pure-food law and the regulations made thereunder. Products such as meat juice, meat extract, etc., which are intended and used only for medicinal purposes, and which are advertised only to the medical profession, are not meat-food products within the meaning of B. A. I. Order No. 137 and this amendment.

These regulations, which for the purpose of identification are designated as Amendment No. 2 to B. A. I. Order No. 137, shall become and be effective on and after October 1, 1906, but shall not apply to the continuous carriage of meat or meat-food products which are in transit on October 1, 1906.

JAMES WILSON, *Secretary of Agriculture*.

INTERSTATE TRANSPORTATION.

Regulation 52.—No person, firm, or corporation shall receive for transportation or transport from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia any carcass, part of carcass, or meat-food product of cattle, sheep, swine, or goats, unless and until a certificate is made and furnished in one of the forms prescribed in Regulations 53, 54, 55, and 56, showing that such meat or meat-food product has been either inspected and passed or exempted from inspection, according to act of Congress of June 30, 1906.

When any shipment of meat or meat-food products covered by these regulations is offered to any common carrier for carriage within the United States as a part of a foreign movement, the same certificate shall be required as if the shipment were destined to a point within the United States.

INSPECTED MEATS AND PRODUCTS.

Regulation 53.—When any carcass, part of carcass, or meat-food product of cattle, sheep, swine, or goats, which has been inspected under the regulations of the Secretary of Agriculture, known as B. A. I. Order No. 137, is offered to any common carrier for transportation from one State or Territory or the District of Columbia to another State or

Territory or the District of Columbia as an interstate or foreign shipment, the person, firm, or corporation offering such carcass, part of carcass, or meat-food product shall make the following certificate and deliver the same to the said common carrier, except as provided in Regulation 54:

(Date)-----, 190 .
 Name of railroad to which offered-----
 Shipper-----
 Consignee-----
 Point of shipment-----
 Destination-----
 Car number and initial-----

The following-described meats or meat-food products have been inspected and passed according to act of Congress of June 30, 1906, and are so marked:

(Signature.)-----

This certificate may be stamped upon or incorporated in any form which is regularly or ordinarily used in the shipment of meat or meat-food products.

Regulation 54.—An establishment at which inspection is maintained under the regulations of the Secretary of Agriculture, known as B. A. I. Order No. 137, may ship from the said establishment to any other establishment at which inspection is maintained, or to any branch house at which inspection is maintained, any meat or meat-food product which has been inspected and passed under these regulations without marking the same "Inspected and Passed," if the said shipment be placed in a railroad car which is sealed by an employee of the Bureau of Animal Industry. In shipments provided for by this regulation the said establishment shall make and deliver to the common carrier, in duplicate, a certificate reading as follows:

(Date)-----, 190 .
 Name of railroad to which offered-----
 Shipper-----
 Number of establishment-----
 Consignee and establishment-----
 Number of consignee-----
 Point of shipment-----
 Point of destination-----
 Car number and initial-----

The following-described meats or meat-food products have been inspected and passed according to act of Congress of June 30, 1906. They are not marked "Inspected and Passed," but have been placed in car No. ----- under the supervision of an employee of the Bureau of Animal Industry, and the said car has been sealed by the said employee with official seal No. -----

(Signature.)-----

The duplicate certificate shall be forwarded immediately by the initial carrier to the Chief of the Bureau of Animal Industry.

EXEMPTED MEATS AND PRODUCTS.

Regulation 55—Retail Butchers and Dealers.—When any carcass, part of carcass, or meat-food product of cattle, sheep, swine, or goats, which has not been inspected under the regulations of the Secretary of Agriculture, known as B. A. I. Order No. 137, is offered for shipment from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia by any retail butcher or retail dealer, other than a farmer, claiming exemption under paragraph (a) of Regulation 2, B. A. I. Order No. 137, the common carrier shall require the following certificate to be made in duplicate by said retail butcher or retail dealer, which certificate shall in all cases show the exemption number designated by the Secretary of Agriculture for said retail butcher or retail dealer:

(Date)-----, 190 .
 Name of railroad to which offered-----
 Shipper-----
 Consignee-----
 Point of shipment-----
 Point of destination-----
 Car number and initial-----
 Exempted establishment number-----

I hereby certify that I am a retail butcher or a retail dealer in meats or meat-food products, and the following-described meats or meat-food products are offered for shipment in interstate commerce to a customer, as exempted from inspection according to act of Congress of June 30, 1906, and exemption certificate No. The said meat or meat-food products are sound, healthful, wholesome, and fit for human food.

(Signature of retail butcher or dealer.)

(Address.)

The duplicate certificate shall be forwarded immediately by the initial carrier to the Chief of the Bureau of Animal Industry. This certificate shall be separate and apart from any waybill, bill of lading, or other form ordinarily used in the shipment of meat.

Regulation 56—Farmers.—When any carcass, part of carcass, or meat-food product of cattle, sheep, swine, or goats is offered to any common carrier for transportation from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia by a farmer, the common carrier shall require the following certificate from the said farmer, which certificate shall be filled out in duplicate:

(Date) -----, 190 .
Name of railroad to which offered -----
Shipper -----
Consignee -----
Point of shipment -----
Point of destination -----
Car number and initial -----
Exempted establishment number -----

I hereby certify that I am a farmer, and that the following-described uninspected carcasses or parts thereof have been slaughtered by me upon my farm and are offered for shipment in interstate commerce as exempted from inspection according to act of Congress of June 30, 1906. The said meat or meat-food products are sound, healthful, wholesome, and fit for human food.

(Signature of farmer.)

(Address of farmer.)

The duplicate certificate shall be forwarded immediately by the initial carrier to the Chief of the Bureau of Animal Industry, Washington, D. C.

Regulation 57.—All original certificates delivered to the common carrier, as required in these regulations, shall be retained and filed by the initial carrier in order that they may be readily checked by this Department in such manner as the Secretary of Agriculture may from time to time prescribe.

Regulation 58.—In all cases the waybills, transfer bills, running slips, or conductors' cards accompanying a car containing the said shipment of meat or meat-food product covered by these regulations must have embodied in, stamped upon, or attached to the same a certificate in the following form by the issuing railroad company, in the case of inspected meats:

(Name of railroad company) United States inspected and passed, as evidenced by shipper's certificate on file with initial carrier.
(Signed) -----, Agent.

In the case of uninspected meats:

(Name of railroad company) Exempted from inspection, as evidenced by shipper's certificate on file with initial carrier.
(Signed) -----, Agent.

EXPORT SHIPMENT.

Regulation 59.—No common carrier shall receive for transportation or transport from the United States to any foreign country any carcass, part of carcass, or meat-food product of cattle, sheep, swine, or goats which has not been inspected and passed, and so marked, under the regulations of the Secretary of Agriculture, known as B. A. I. Order No. 137, except from a farmer, or exempted retail butcher or retail dealer supplying a customer, when the provisions of this amendment, requiring certificates for interstate movements, shall apply to the meat or meat-food product offered for foreign movement; and no master of any steam or sailing vessel shall receive for transportation or transport from the United States to Great Britain and Ireland or any of the countries of

continental Europe any carcass, part of carcass, or meat-food-product of cattle, sheep, swine, or goats, except ship stores, unless and until a certificate of inspection covering the same has been issued and delivered as provided in Regulation 45 of the regulations of the Secretary of Agriculture, known as B. A. I. Order No. 137. The requirements of the certificate provided for in Regulation 45 are waived for meat and meat-food products for export to foreign countries other than those named in this regulation.

(AMENDMENT No. 6 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after October 1, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

It is ordered, That Exceptions 5 and 12 of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, be and the same are hereby amended in the following particulars, to wit:

First. The first paragraph of Exception 5 is amended to read as follows:

Exception 5.—OKLAHOMA. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area and no tick-infested horses or mules shall be moved or allowed to move, except as hereinafter provided, into the counties of Cleveland, Pottawatomie, Lincoln, Pawnee, those portions of Blaine and Canadian counties south of the Canadian River, that portion of Caddo County north of the right of way of the Chicago, Rock Island and Pacific Railway, and that portion of Kiowa County lying north of Comanche County and the line between townships 4 and 5 north, extended westward to its intersection with the North Fork of Red River, those portions of the counties of Oklahoma, Logan, Payne, and Noble lying east of the right of way of the Atchison, Topeka and Santa Fe Railway, or into the Kansas Nation or Osage Nation: *Provided*, That from October 1 of each year to May 15 of the following year cattle of said modified quarantined area and tick-infested horses and mules may be moved into the above-described territory after having been satisfactorily dipped in Beaumont crude petroleum, or otherwise properly treated, under the supervision of an inspector of the Bureau of Animal Industry: *And provided further*, That such animals after being so dipped or treated shall be shipped in clean and disinfected cars and shall be accompanied by a certificate of dipping or treatment issued by the inspector supervising the same.

Second. Exception 12 is amended to read as follows:

Exception 12.—INDIAN TERRITORY. During the continuance of the quarantine as herein established and modified no cattle originating in the said modified quarantined area and no tick-infested horses or mules shall be moved or allowed to move, except as hereinafter provided, into Registration Districts Nos. 1, 2, 3, 4, and 5, being that portion of Cherokee Nation bounded on the south by the northern boundary of the Creek Nation, and a line extended from the northeast corner of said Creek Nation due east to the Arkansas State line:

Provided, That from October 1 of each year to May 15 of the following year cattle of said modified quarantined area and tick-infested horses and mules may be moved into the above-mentioned Registration Districts (Nos. 1, 2, 3, 4, and 5) after having been satisfactorily dipped in Beaumont crude petroleum, or otherwise properly treated under the supervision of an inspector of the Bureau of Animal Industry: *And provided further*, That such animals after being so dipped or treated shall be shipped in clean and disinfected cars and shall be accompanied by a certificate of dipping or treatment issued by the inspector supervising the same.

No cattle from said registration districts shall be moved or allowed to move, except as provided for immediate slaughter, to any point which is located outside of the modified quarantined area until the said cattle shall have been inspected, found free from infection, and a written permit is issued by an inspector of the Bureau of Animal Industry, nor until permission shall have been obtained in advance of the movement from the proper official of the State or Territory into which the cattle are to be shipped.

Done at Washington this eighteenth day of September, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(AMENDMENT NO. 3 TO B. A. I. ORDER NO. 137.)

Regulations Governing the Interstate and Foreign Transportation of Meats and Meat-Food Products Prepared with Preservatives Prior to October 1, 1906, and Amending Regulation No. 45, Governing the Transportation to a Foreign Country of Meats and Meat-Food Products.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., October 1, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following regulations are hereby prescribed for the transportation in interstate and foreign commerce of the carcasses, parts of carcasses, meats, and meat-food products of cattle, sheep, swine, and goats.

These regulations, which for purposes of identification are designated as Amendment No. 3 to B. A. I. Order No. 137, shall become and be effective on and after October 1, 1906.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 60.—Meats prepared prior to October 1, 1906, to which have been applied externally small quantities of preservative, which have heretofore been usual in the preparation of said meat, but which are now prohibited by B. A. I. Order No. 137 and amendments thereto, will be examined as provided in Regulation 50, paragraphs (a) to (h), and, if found to conform to the regulations of the Secretary of Agriculture in all respects, except as herein mentioned, may be marked "U. S. Inspected and Passed under Regulation 60," in the manner provided in paragraph (k) of Regulation No. 50, and will then be admitted into interstate and foreign commerce, under the regulations contained in Amendment No. 2 to B. A. I. Order No. 137.

Amendment to Regulation No. 45.—Regulation 45, as contained in B. A. I. Order No. 137, is hereby amended to read as follows:

"*Regulation 45.*—The inspector in charge of an establishment shall issue certificates of inspection for all carcasses of cattle, sheep, swine, and goats, and the meats or meat-food products thereof, which are to be exported to foreign countries. Each certificate shall cite the name of the shipper, the name of the consignee, the destination, the establishment number or numbers on the labels, the number of the stamps attached to the article to be exported, and the shipping marks. These certificates shall be issued in serial numbers and in triplicate form. Only one certificate shall be issued for each consignment unless otherwise directed by the Chief of the Bureau of Animal Industry.

"Both the original and duplicate certificates shall be delivered by the inspector to the shipper. The original certificate provided by law for the chief officer of the vessel shall be filed with the customs officers at the time of filing the master's manifest or the supplemental manifest."

Under date of September 25, 1906, the Secretary of Commerce and Labor issued the following instructions for the guidance of collectors of customs:

On and after October 1, 1906, no collector or other officer of customs shall issue clearance to any vessel carrying meat or meat-food products for export to Europe until he is satisfied that certificates covering the same, as prescribed by the act of June 30, 1906, have been obtained from the Department of Agriculture.

Collectors and other officers of customs may accept, as satisfactory proof of the fact that the required certificates have been obtained—

A verified statement in writing, in form prescribed by the collector, made by the master or agent of the vessel at the time of application for clearance, to the effect that no meat or meat-food products are or will be included in the cargo of the vessel unless duly marked "U. S. Inspected and Passed;" that certificates required by Regulation 45 of B. A. I. Order No. 137, as amended by Amendment No. 3 to the said order, have been obtained from the Department of Agriculture, and that such certificates, if not filed with the master's manifest at the time of issue of clearance, will be filed with the supplemental manifest:

Provided, That when said supplemental manifest is filed, a second duly verified statement, in writing, shall be made by the master or agent that the required certificates covering each shipment of meat or meat-food products have been obtained, and that the name of shippers, destination, shipping marks, and total number of stamps attached have been filed with said supplemental manifest, and that all meat and meat-food products in the cargo of said vessel are covered by the certificates attached to the master's supplemental manifest.

If the master or agent of any vessel shall fail at any time to so file all required certificates either with the master's manifest or with the supplemental manifest, no clearance shall thereafter be granted to any vessel represented by said master or agent until all required certificates of inspection have been duly presented and filed.

(AMENDMENT NO. 4 TO B. A. I. ORDER NO. 137.)

Amending Regulations 22, 23, 24, and 25, Governing the Labeling of Carcasses in Establishments where Inspection is Maintained; Amending Regulation 41, Governing Entrance of Unmarked Fats into Establishments where Inspection is Maintained; and Amending Regulation 50, Governing the Examination and Relabeling of Meats and Meat-Food Products on Hand.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., October 2, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), Regulations 22, 23, 24, 25, 41, and 50 are hereby amended as hereinafter given.

This amendment is designated as Amendment No. 4 to B. A. I. Order No. 137 and shall become and be effective at once.

JAMES WILSON, *Secretary of Agriculture.*

Regulations 22, 23, 24, and 25.—These regulations are amended to permit the placing, under the personal supervision of a departmental employee, of labels upon carcasses by employees of establishments at which inspection is maintained.

Regulation 41.—This regulation is amended to read as follows. The new matter is italicized.

"Regulation 41—Rendering of lard and tallow.—The rendering of all fats into lard, tallow, oils, and stearin at establishments where inspection is maintained shall be closely supervised by employees of the Department. All portions of carcasses rendered into lard and tallow must be clean and wholesome. Tanks and vats used for rendering condemned carcasses and refuse products must not be connected in any manner with tanks, vats, or other receptacles used for lard or other edible products. Unmelted fat from carcasses which have been U. S. inspected and passed and so marked, which is not marked or stamped 'U. S. Inspected and Passed,' and which upon inspection is found to be sweet, clean, and of healthful appearance, may be received, inspected, and rendered at a temperature not lower than 170° F. for one hour."

Regulation 50.—Paragraph (j) of Regulation 50 is amended to read as follows:

"(j) Sweet pickled, dry salted, smoked, and other similar meats, lard, lard compounds, lard substitutes, butterine, and oleomargarine shall be inspected, and if found to be clean, healthful, wholesome, and free from any condition contrary to the regulations governing the meat inspection of the United States Department of Agriculture, they shall be labeled or marked as provided in paragraph (k) of this regulation: *Provided*, That during the months of October and November, 1906, shippers who are in possession of sweet pickled, dry salted, smoked, or other similar meats, lard, lard compounds, lard substitutes, butterine, and oleomargarine, which were on hand October 1, 1906, and who have affidavits of the packer who prepared the meat or product that it was cured or prepared prior to October 1, and that no prohibited preservative has been applied thereto, except as allowed by Regulation 60, may mark sweet, clean, sound, wholesome meat or meat-food product with the words 'Inspected and Passed under Regulation 50—Provisional,' and such meat or product will then be admitted into interstate and foreign commerce. All persons who mark or ship meat or meat-food product under this amendment shall immediately report to the Chief of the Bureau of Animal Industry at Washington a full description and the weight of the meat or product so marked and shipped. This amendment is issued because it is impossible, without seriously interfering with the commerce of the country, to examine each piece of meat in the United States. Attention is called, however, to the fact that it is a violation of law, punishable by a fine of \$10,000 and imprisonment for a term of two years, for any person to forge, counterfeit, simulate, or use without authority

any of the marks provided for by the Regulations of the Secretary of Agriculture. The movement of meat under the provisional marking provided for by this amendment will be closely watched, and any violation of the regulation will be prosecuted."

Paragraph (k) of Regulation 50 is amended to read as follows:

"(k) For the purpose of marking products inspected under this regulation an inspection stamp will be furnished by the Department, reading as follows: 'U. S. Inspected and Passed under Regulation 50.' When necessary a rubber stamp will be issued in lieu of the paper stamp. One label upon an unopened case or package of canned meats shall be considered sufficient: *Provided*, That when a brand or line of canned meat-food products has been passed by the Department as wholesome, and it is necessary to ship a portion of that line or brand in interstate commerce before the stamps provided by the Department can be received, the shipper may mark or stamp the shipment 'Inspected and Passed under Regulation 50—Provisional.' This amendment is issued to prevent an immediate scarcity of canned meat-food products. The movement under the provisional marking will be watched closely, and any improper use of this provisional mark will be the subject of prosecution. The burden is upon the shipper who attaches the provisional mark to know that the line or brand has been passed by the Department."

(AMENDMENT NO. 7 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after November 1, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY.

It is ordered, That Exception 10 of Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, effective on and after February 1, 1906, be, and the same is hereby, amended to read as follows:

Exception 10—Open season.—During the months of January, November, and December of each year cattle originating in the modified quarantined area shall not be moved from the modified quarantined area for purposes other than immediate slaughter into the States of Missouri and Kansas, the Territories of Arizona and New Mexico, and those portions of California, Texas, Tennessee, and Georgia not included in the modified quarantined area, until the said cattle shall have been inspected and found free of infection and a written permit for the movement is issued by an inspector of the Bureau of Animal Industry or by a duly authorized inspector of the State or Territory to which the cattle are destined, nor until permission shall have been obtained from the proper official of the said State or Territory. During the months of January and February, the first fifteen days of March, and the last sixteen days of December in each year cattle originating in the modified quarantined area may be moved under the above-mentioned restrictions into those portions of the States of Virginia and North Carolina not included in the modified quarantined area. During the months of January and December in each year cattle originating in the modified quarantined area may be moved under the above-mentioned restrictions into that portion of Oklahoma not included in the modified quarantined area.

Cattle originating in and shipped from the modified quarantined area into any State outside of the modified quarantined area, other than those States and Territories and portions thereof set out in this exception, shall not be moved into or unloaded in transit through any of the States or Territories or portions thereof hereinbefore set out in this exception within three months of the date of the movement from the modified quarantined area.

Cattle which are moved from the modified quarantined area into those States or Territories or portions thereof hereinbefore set out in this exception, under certificates from inspectors either of the Bureau of Animal Industry or of the States or Territories to which the cattle are destined for feeding or stocking purposes, shall not be placed in stock pens which have been reserved for cattle originating in the modified quarantined area.

Done at Washington this fifteenth day of October, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture*.

Meat Inspection Rulings—1 A.

DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., October 29, 1906.

The following rulings under the meat-inspection law and the regulations made thereunder are announced by the Department of Agriculture:

TRANSPORTATION.

1. No shipment of meat or meat-food product shall be accepted for transportation in interstate commerce by any carrier until the carrier has received from the shipper a certificate in one of the forms prescribed in the regulations.

2. When it is desired to divert a shipment of inspected and marked meat or meat-food product from the original destination, such diversion may be made without reinspection if a new certificate showing the changed destination be given to the carrier by the owner or shipper, who may or may not be the original shipper. In case of wreck or other extraordinary emergency the carrier may divert the shipment without waiting for a new certificate, but in all such cases of diversion or reloading full information regarding the same shall be sent promptly to the Chief of the Bureau of Animal Industry, together with full information regarding the change of cars, etc.

3. The right of the farmer to ship in interstate or foreign commerce the carcasses of animals slaughtered on the farm is a right personal to the farmer, and applies to the shipment of carcasses of such animals in interstate or foreign commerce only when such carcasses are shipped by the farmer or his agent. The carcasses of animals slaughtered by the farmer on the farm, which are shipped by the farmer to a commission man for sale, may be reshipped by the commission man by signing a farmer's certificate as agent for the original shipper. It is incumbent upon the commission man to know that the carcasses covered by the certificate he issues are those of animals slaughtered by a farmer on the farm and to have authority to sign for the farmer in making the reshipment. Wholesale dealers who are not acting as agents for farmers, but who own carcasses of animals slaughtered by a farmer on the farm, may not reship said carcasses in interstate or foreign commerce.

4. Reshipments of inspected meat and meat-food products which are sound and wholesome at the time of reshipment may be made without reinspection when the meat or meat-food products, or the containers thereof, are marked "U. S. Inspected and Passed," and the meat or meat-food products have not been processed, other than by smoking, since they were originally shipped under Regulations 53 or 54. If these conditions do not obtain, reshipments without reinspection can not be made.

5. The transportation of meat or meat-food product from one point in a State or Territory to another point in the same State or Territory, when in course of shipment the meat or meat-food product is taken through another State or Territory, is interstate commerce, and brings the said transportation within the scope of the meat-inspection law and regulations.

CASINGS.

1. Unfilled "casings" shall be regarded as containers and not as meat-food products, but when such casings are to be exported to a foreign country which requires a certificate showing that the casings are products of animals which were free from contagious disease at time of slaughter the necessary stamps and a certificate will be issued by the inspector in charge.

LABELS.

1. Labels or stickers, bearing the inspection legend, separate and apart from the trade label, may, under the supervision of a Department employee, be used on inspected and passed meats which are wrapped in paper or cloth or which are placed in pasteboard containers. But no such label or sticker, bearing an inspection legend, can be used in establishments where inspection is not maintained.

2. Products not classed as "meat-food products," which are prepared at establishments where inspection is not maintained, and which contain small quantities of meats which have been inspected and passed under the meat-inspection law, and no other meats, may bear a label with a personal statement of the manufacturer that the meat contained therein has been inspected and passed at an establishment where inspection is maintained. In each such case, however, the label before being used must be submitted to the Chief of the Bureau of Animal Industry for approval.

3. No label will be approved for use after January 1 next which contains an incorrect or false statement of the weight of the package or which does not show that the weight, if given, is net or gross.

DEFINITIONS.

1. When the words "meat" or "meat-food products" are used in the regulations or rulings of the Secretary of Agriculture they mean meat or meat-food products of cattle, sheep, swine, or goats, and do not include meat or meat-food products of other animals.

2. Nonedible grease and nonedible tallow, derived from cattle, sheep, swine, or goats, are not considered meat-food products. However, when nonedible grease and nonedible tallow are to be exported to a country for which the requirement of a certificate has not been waived, the collectors of customs, under instructions from the Secretary of Commerce and Labor, will require an affidavit from the exporter that the grease and tallow to be exported are nonedible and not intended for food purposes. Carriers in interstate commerce should require a written statement from shippers that the tallow or grease is nonedible, and that it is so marked.

JAMES WILSON, *Secretary.*

(AMENDMENT NO. 5 TO B. A. I. ORDER NO. 137.)

Regulations Governing the Interstate Transportation of Inspected and Passed Meats and Meat-Food Products which are Alleged to be or have Become Unfit for Food, and Restricting their Admission into Establishments where Inspection is Maintained.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., November 15, 1906.

For the purpose of preventing the use in interstate commerce of inspected and passed meat and meat-food products which after inspection have become unsound, unwholesome, or otherwise unfit for human food, under authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following regulation is hereby prescribed for the transportation in interstate commerce of the said meat and meat-food products of cattle, sheep, swine, and goats.

This regulation, which for the purpose of identification is designated as Amendment No. 5 to B. A. I. Order No. 137, shall become effective on and after December 1, 1906.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 61.—Meats and meat-food products which have been inspected and passed and so marked, and which have been transported from the establishments at which they were prepared into the channels of trade, and which are alleged or known to have become unsound, unwholesome, or otherwise unfit for human food, may be transported in interstate commerce under the following restrictions:

(1) Inspected and marked meat or meat-food product which is alleged to be unsound, unwholesome, or otherwise unfit for food may be shipped by the owner thereof from one State or Territory or the District of Columbia to any establishment at which inspection is maintained in the same or a different State or Territory, if a written permit in duplicate for such shipment be first had and obtained from the Chief of the Bureau of Animal Industry. In all such shipments both the original and duplicate copies of the permits shall be surrendered to the carrier accepting the meat or meat-food product, who shall require the shipper to furnish three copies of the form of certificate hereinafter given. One of these certificates and the duplicate copy of the permit shall be retained by the carrier; another copy of the certificate, together with original permit, shall be mailed by the carrier to the Chief of the Bureau of Animal Industry, Washington, D. C.; and the third copy shall be addressed and mailed by the carrier to the Bureau of Animal Industry inspector in charge at the point to which the shipment is consigned. Upon the arrival of the shipment at the establishment where inspection is maintained the inspector in charge shall cause a careful inspection to be made of the shipment, to determine whether or not it is unsound, unwholesome, or otherwise unfit for food. Should the meat or meat-food product contained in the shipment prove to be unsound, unwholesome, or otherwise unfit for food, it shall at once be stamped "U. S. Inspected and Condemned" and be immediately tanked or removed to the condemned room. If the meat or meat-food product contained in the shipment shall prove to be sound, wholesome, and fit for food, the inspector shall allow the meat or meat-food product to enter the establishment.

(2) Inspected and marked meat or meat-food product which is alleged to be unsound, unwholesome, or otherwise unfit for human food may be shipped by the owner thereof from one State or Territory or the District of Columbia to any jobber, wholesaler, or other dealer from whom the said meat or meat-food product was purchased, if a written permit, in duplicate, for such shipment be first had and obtained from the Chief of the Bureau of Animal Industry. In all such shipments both the original and duplicate copies of the permits shall be surrendered to the carrier accepting the meat or meat-food product, who shall require the shipper to furnish two copies of the form of certificate hereinafter given. One of these certificates and the duplicate copy of the permit shall be retained by the carrier, and the other copy of the certificate, together with the original permit, shall be mailed by the carrier to the Chief of the Bureau of Animal Industry, Washington, D. C. If the meat or meat-food product which is shipped under this regulation proves to be unsound, unwholesome, or otherwise unfit for human food, it may not be reshipped in interstate commerce as a food product. Attention is directed to the meat-inspection law, which provides a penalty of a fine of \$10,000 and imprisonment for two years for any person who ships for human consumption in interstate or foreign trade any meat or meat-food product which is unsound, unwholesome, or otherwise unfit for human food.

(3) Inspected and marked meat or meat-food product which is known to be unsound, unwholesome, or otherwise unfit for human food may be shipped by the owner thereof from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia, for use in the arts, such as the shipment of lard which has become unfit for food to a soap factory for use in making soap. No such shipment shall be made unless and until a written permit, in duplicate, shall be first had and obtained from the Chief of the Bureau of Animal Industry. In all such shipments both the original and duplicate copies of the permits shall be surrendered to the carrier accepting the meat or meat-food product, who shall require the shipper to furnish two copies of the form of certificate hereinafter given. One of these certificates and the duplicate copy of the permit shall be retained by the carrier, and the other copy of the certificate, together with the original permit, shall be mailed by the carrier to the Chief of the Bureau of Animal Industry, Washington, D. C. In addition to the above requirements, no such shipment shall be accepted by any carrier unless and until the meat or meat-food product which is known to be unsound, unwholesome, or otherwise unfit for food shall have been denatured or otherwise rendered unavailable for food purposes under the supervision of an employee of the Bureau of Animal Industry. The carrier shall also require the shipper to certify that the meat or meat-food product has been so denatured or otherwise rendered unavailable for food purposes. The written certificate of the shipper that the meat or meat-food product has been denatured shall be forwarded by the carrier to the Chief of the Bureau of Animal Industry with the original permit and the shipping certificate.

(4) The certificate required by this regulation shall be in the following form and shall in all cases show a description and the weight of the meat or meat-food product:

Date-----, 190 .
 Name of carrier to which offered-----
 Shipper-----
 Consignee-----
 Point of shipment-----
 Destination-----
 Car number and initial-----

The following-described meats or meat-food products have been inspected and passed according to act of Congress of June 30, 1906, and are so marked. It is {alleged} {known} that the said meat or meat-food products are unsound, unwholesome, and unfit for food.

DESCRIPTION AND WEIGHT OF SHIPMENT.

(Signature of shipper.)

(5) In shipments of meat and meat-food products which are known to be unsound, unwholesome, or otherwise unfit for human food, and which therefore require an additional certificate of denaturing, it is suggested that the following form of certificate be used:

-----, of the city of ----- and State of -----
 hereby certifies that the following-described inspected and marked meat or meat-food product has been denatured or otherwise rendered unavailable for food purposes under the supervision of -----, an employee of the Bureau of Animal Industry,

and is offered to the _____ for transportation from _____, in the State of _____, to _____, in the State of _____

DESCRIPTION OF MEAT.

(Signature of shipper.)

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(6) On all shipments made under Regulation 61 the waybills, transfer bills, running slips, or conductor's cards accompanying the said shipment of meat or meat-food products must have embodied in, stamped upon, or attached to the same a certificate in the following form by the issuing railroad company:

(Name of railroad company.)

U. S. Inspected and passed and alleged unsound, unwholesome, or otherwise unfit for food, as evidenced by shipper's certificate on file with initial carrier.

(Signed) -----, Agent.

(AMENDMENT NO. 6 TO B. A. I. ORDER NO. 137.)

Regulations Governing the Use of Dyes, Chemicals, and Preservatives.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., November 15, 1906.

For the purpose of preventing the use in interstate or foreign commerce of meat or meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, under the authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), Regulation 39 is hereby amended as hereinafter given. This amendment is designated as Amendment No. 6 to B. A. I. Order No. 137 and shall become effective at once.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 39.—(a) No meat or meat-food product for interstate commerce, or for foreign commerce except as hereinafter provided, shall contain any substance which lessens its wholesomeness, or any drug, chemical, harmful dye, or preservative, other than the preservatives common salt, sugar, wood smoke, vinegar, pure spices, and, pending further inquiry, saltpeter. No dye, unless specifically authorized by a Federal statute, shall be used in any meat-food product prepared for interstate or foreign commerce, until the use of such dye has been specifically authorized by the Secretary of Agriculture. The Department is conducting careful investigations into the effect of various dyes upon meat and meat-food products, and, while the investigation of all dyes is not completed, it has been demonstrated that certain dyes do not render meat and meat-food products unsound, unhealthful, unwholesome, or otherwise unfit for human food. The names of harmless dyes which may be used will be communicated to the inspectors in charge from time to time as the investigation progresses, and no meat or meat-food product which contains a dye whose use has not been approved by the Secretary of Agriculture shall be marked "Inspected and Passed" or allowed in interstate or foreign commerce. Inspection and sampling of prepared meat and meat-food products by Department employees shall be conducted in such manner and at such times as may be necessary to secure a rigid enforcement of this regulation.

(b) In accordance with the direction of the foreign purchaser or his agent, meat and meat-food products prepared for export may contain preservatives in proportions which do not conflict with the laws of the foreign countries to which they are to be exported. When such meat or meat-food products are prepared for export under this regulation they shall be prepared in compartments of the establishment separate and apart from those in which meat and meat-food products are prepared according to paragraph (a) of this regulation, and such products shall be kept separate and shall be labeled with special trade labels, approved by the Secretary of Agriculture, and indicating that such products are for export only. Special export certificates will be issued for meat and meat-food products of this character, and, if the products are not exported, under no circumstances shall they be allowed to enter domestic trade.

The law permits the use, under the above restrictions, of preservatives in meat and meat-food products for export, but does not permit the use of any dye or coloring matter not permitted in meats prepared for interstate trade. Neither is there in the law any authority for allowing a trade label for use in export trade which is not permitted in interstate trade.

(AMENDMENT NO. 8 TO RULE 1, REVISION 1.)

To Prevent the Spread of Splenetic Fever in Cattle (Effective on and after December 1, 1906).

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SECRETARY.

The fact has been determined by the Secretary of Agriculture, and notice is hereby given, that the infectious disease known as splenetic, southern, or Texas fever is not now known to exist, or exists to a slight extent only, among cattle in certain counties of the State of Virginia quarantined by Rule 1, Revision 1, dated January 25, 1906, and effective February 1, 1906.

Now, therefore, I, JAMES WILSON, SECRETARY OF AGRICULTURE, under authority of law, do hereby amend Rule 1, Revision 1, to prevent the spread of splenetic fever in cattle, in the following particulars, to wit:

First. That part of Exception 1 which describes the quarantine line through the State of Virginia is amended to read as follows:

VIRGINIA.

Beginning at the boundary line of Virginia at its southwestern corner (Lee County); thence east along the southern boundary of Virginia to the southwestern corner of Patrick County; thence northerly and easterly along the western boundary of Patrick County to the northernmost point of said county; thence easterly and northerly along the southern and eastern boundaries of Franklin County to the northeastern corner of said county; thence easterly along the northern boundaries of Pittsylvania and Halifax counties to the southeastern corner of Campbell County; thence northerly along the eastern boundary of Campbell County to its intersection with the southern boundary of Appomattox County; thence easterly and southeasterly along the southern boundaries of Appomattox, Prince Edward, and Nottoway counties to the southeastern corner of Nottoway County; thence northerly, easterly, westerly, and northeasterly along the eastern boundaries of Nottoway, Amelia, and Powhatan counties to the James River; thence following the James River to the southeastern corner of Charles City County; thence northerly and easterly along the western and northern boundaries of James City County to the York River; thence southeasterly along the boundaries of James City and York counties to the northeastern corner of Elizabeth City County; thence westerly, northwesterly, and southerly along the boundaries of Elizabeth City and Warwick counties to the James River; thence southeasterly along the course of the said river to the northwest corner of Norfolk County; thence southerly along the western boundary of said county to its intersection with the northern boundary of North Carolina; thence east along the southern boundaries of Norfolk and Princess Anne counties to the Atlantic Ocean.

Second. Exception 11 is revoked.

Done at Washington this twenty-first day of November, 1906.

Witness my hand and the seal of the Department of Agriculture.

[SEAL.]

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER NO. 139.)

Regulations Governing the Inspection, Humane Handling, and Safe Transport of Animals Carried by Ocean Steamers from the United States to Foreign Countries.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., November 30, 1906.

Under authority of the act of Congress approved August 30, 1890, entitled "An act providing for the inspection of meats for exportation, prohibiting the importation of adulterated articles of food or drink, and authorizing the President to make proclama-

tion in certain cases, and for other purposes;" of the act of Congress approved March 3, 1891, entitled "An act to provide for the safe transport and humane treatment of export cattle from the United States to foreign countries, and for other purposes," and of the acts of Congress approved March 22, 1898, and June 30, 1906, making appropriations for the Department of Agriculture, the following regulations are hereby prescribed for the inspection, humane treatment, and care of live stock and for fitting vessels engaged in the transportation of animals from the United States to foreign countries.

These regulations, which for the purpose of identification are designated as B. A. I. Order No. 139, supersede all previous regulations on the same subject, and shall become and be effective on and after December 1, 1906.

JAMES WILSON, *Secretary.*

GENERAL PROVISIONS.

Regulation 1.—No cattle, sheep, swine, or goats shall be exported from the United States to any foreign country unless and until the same have been inspected and found free from disease or exposure thereto by an inspector of the Bureau of Animal Industry of this Department; and unless the Secretary of Agriculture shall have waived the requirement of a certificate of inspection for the particular country to which such animals are to be exported no clearance shall be issued to any vessel carrying such animals, unless and until a certificate of inspection showing freedom from disease or exposure thereto shall have been issued by the Department of Agriculture. The requirement of a certificate for shipments of such animals to Cuba, the West Indies, Mexico, Central America, and the countries of South America, excepting Argentina and Uruguay, is hereby waived.

PLACES OF INSPECTION.

The inspection provided for in this regulation will be made at any of the following-named stock yards: Chicago, Ill.; Kansas City, Mo.; Omaha, Nebr.; South St. Joseph, Mo.; National Stock Yards, Ill.; Indianapolis, Ind.; Buffalo, N. Y., and Pittsburg, Pa., and at the following ports of export: Portland, Me.; Boston, Mass.; New York, N. Y.; Philadelphia, Pa.; Baltimore, Md.; Norfolk and Newport News, Va.; Port Royal, S. C.; New Orleans, La., and Galveston, Tex. All animals will be inspected at ports of export, regardless of the fact that they may or may not have been inspected at the above-named stock yards.

HORSES.

Regulation 2.—Horses shall be entitled to the inspection provided for in these regulations, and certificates shall be issued whenever required by the country to which the horses are to be exported; but horses may be shipped without inspection and certification, at shippers' risk, to countries which do not demand such inspection and certification as a prerequisite to admission.

DEFINITION OF TERMS.

Regulation 3.—Whenever in these regulations the following words, names, or terms are used, they shall be construed as follows:

Inspector of Port, Inspector, Assistant, Employee.—These terms shall mean, respectively, the inspector in charge of the Bureau of Animal Industry station at the port from which the animals are to be exported, and inspectors, assistants, and employees of the Bureau of Animal Industry.

Lumber.—This word, unless otherwise stated, shall mean hard pine, spruce, oak, or other hard wood.

Animals.—This word refers to cattle, sheep, swine, and goats, also horses, unless it is inapplicable to them under Regulation 2.

Horses.—This word shall include mules and asses.

INSPECTION AND SHIPMENT.

Regulation 4.—Only animals found to be healthy and free from disease and shown not to have been exposed to the contagion of any disease shall be allowed shipment, and all animals inspected and passed shall be loaded into clean and disinfected cars.

All animals shall be inspected or reinspected at the port of export. Railroad companies will be required to furnish clean and disinfected cars for the transportation of animals for export, and the proprietors of the various stock yards and stables located at the ports of export shall keep separate, clean, and disinfected stock yards and pens or stables for the use of export animals.

IDENTIFICATION OF ANIMALS AND NOTIFICATION OF SHIPMENT.

Regulation 5.—Shippers shall notify the inspector in charge of the yards of intended shipments of animals and the number and designation of cars in which they are to be shipped, and shall inform said inspector of the locality from which said animals have been brought, and the name of the feeder of said animals, and shall furnish such other information as may be practicable for the proper identification of the place from which said animals have come.

Regulation 6.—The inspector after passing said animals shall notify the inspector in charge of the port of export, and inspectors located at intermediate cities where the animals may be unloaded for feeding and watering, of the inspection and shipment of such animals, the number and kind of animals shipped, and the numbers and designations of the cars containing them.

TRANSPORTATION FROM YARDS TO STEAMERS.

Regulation 7.—Export animals shall not be unnecessarily passed over any highway or removed to cars or boats which are used for conveying other animals. Boats transporting said animals to the ocean steamer must first be cleansed and disinfected with lime wash under the supervision of the inspector of the port, and the ocean steamer shall, before receiving said animals, be thoroughly cleansed or disinfected in accordance with the directions of said inspector. When passage upon or across the public highway is unavoidable in the transportation of animals from the cars to the boat it shall be under such careful supervision and restrictions as the inspector may direct.

ANIMALS NOT ALLOWED SHIPMENT.

Regulation 8.—Any animals that are offered for shipment to a foreign country which have not been inspected and transported in accordance with these regulations, or which, having been inspected, are adjudged to be infected or to have been exposed to infection so as to be dangerous to other animals or to be otherwise unfit for shipment, shall not be allowed upon any vessel for exportation.

SUPERVISION TO STEAMERS—CLEARANCE PAPERS.

Regulation 9.—The supervision of the movement of animals from cars, yards, and stables to the ocean steamer at the port of export will be in charge of the inspector of the port.

The inspector at the port of export shall notify the collector of the port, or his deputy, of the various shipments of animals that are entitled to clearance papers.

NOTIFICATION TO INSPECTORS OF INTENDED SHIPMENTS ON STEAMERS.

Regulation 10.—The exporters of animals or the owner, agent, or master of any vessel desiring to transport animals from any port of the United States to a foreign country shall notify the inspector in charge of the port from which said vessel is to clear of such intended shipment at least two days in advance thereof, and if the regulations prescribed have been complied with a clearance shall be authorized by such inspector.

SPACE ON VESSELS.

Regulation 11.—Export animals must not be carried on any part of the vessel where they will interfere with the proper management of the vessel, or with the efficient working of the necessary lifeboats, or with the requisite ventilation of the vessel, and may be carried only as hereinafter specified.

CATTLE.

Regulation 12.—Cattle must have 6 feet vertical space on all decks, free of all obstructions; cattle may, however, be placed on raised floors over pipes and other similar obstructions where the vertical space is 5 feet 6 inches. Cattle carried on the upper or other exposed decks must be allowed a space of 2 feet 6 inches in width by 8 feet in depth per head. Cattle loaded under decks must be allowed a space of 2 feet 8 inches in width by 8 feet in depth, except in the case of regular cattle ships with satisfactory ventilation, which may fit with an allowance of 2 feet 6 inches in width.

No more than four head of cattle will be allowed in each pen, except at the ends of a row, where five may be allowed together. Cattle in single stalls shall be allowed 3 feet

in width. Cattle standing between stanchions, sounding tubes, ventilators, and other obstructions, though in continuous pens, must be allowed 8 feet in width. Vessels will be allowed to carry three deck loads of cattle, but where it is desired to carry cattle on the lower or steerage deck, said deck must in all cases be fitted at 2 feet 8 inches and no animals allowed upon hatches. Special permission for carrying cattle on the steerage deck must be obtained from the inspector, and will be granted in cases where said deck is provided with sufficient ventilation as hereinafter prescribed.

SHEEP AND GOATS.

Regulation 13.—The space for each sheep or goat shall be 4 feet long by 14 inches wide, and for lambs or goats under 100 pounds in weight 4 feet by 12 to 13 inches.

Sheep pens shall not exceed 20 feet by 8 feet, where two tiers are carried, and each tier shall have a clear vertical space of not less than 3 feet. During the summer season sheep shall not be loaded in tiers under decks, but during the winter season two tiers may be placed in each wing and only one tier amidships. One single deck of sheep may be carried upon the shelter decks for cattle when said decks are permanently built and are composed of tongued-and-grooved boards, provided such sheep fittings do not conflict with Regulation 12. Sheep pens on shelter deck shall not exceed 12 feet in width and must be supplied with athwartship partitions every 14 feet. Such fittings shall be secured to the shelter deck in the manner provided by Regulation 41.

SWINE.

Regulation 14.—The space for swine not exceeding 150 pounds in weight shall be the same as that specified for full-grown sheep and goats, and for those under 100 pounds in weight the same as for lambs and for goats of less than 100 pounds in weight. Additional space shall be required by the inspector for unusually large hogs.

HORSES.

Regulation 15.—All horses must have 6 feet 3 inches clear vertical space from beams of deck overhead to deck underfoot, and, so far as possible, shall be placed between the overhead athwartship beams. Each horse must be allowed a space of 2 feet 6 inches in width by 8 feet in depth, and additional space shall be required by the inspector for very large horses.

Separate stalls must be erected for all horses. When horses are placed directly under athwartship beams, the beams must be guarded by 4-inch strips of wood. A space of 8 by 10 feet square must be reserved on each steamer carrying 22 or more horses for use in caring for horses becoming sick in transit. When placed in the same compartment with cattle, horses must be separated by fore-and-aft alleyways and temporary athwartship bulkheads, the length of which shall not be less than the depth of the stalls.

UPPER-DECK FITTINGS.

Regulation 16.—No animals shall be allowed on the poop deck or within 20 feet of the breakwater on the spar deck, between the 1st of October and the 1st of April, except on ships provided with houses constructed of iron in each wing and of sufficient width and height to protect the fittings, when the fittings may be constructed to abut such houses. Horses shall not be allowed upon the bridge deck, except when this deck is water-tight and completely covered in and fitted for horses. Horses shall not be allowed upon the spar deck when temporary fittings are used. No cattle or horses shall be carried upon the upper decks where the outside rails are not of sufficient strength to hold fittings securely and measure less than 3 feet in height from the deck. When animals are carried upon the upper decks, strong breakwaters shall be erected at each end and on both sides. Permanent fittings may be constructed either of iron or wood, as hereinafter specified.

ALLEYWAYS.

Regulation 17.—All steamers engaged in carrying animals for export will be required to provide alleyways as provided by this regulation. Alleyways in front of and between pens used for feeding and watering cattle must have a width of 3 feet, except at end of alleyways in bow and stern of ship, and where obstructions less than 3 feet in length occur the width may be reduced to a minimum of 18 inches. Alleyways in front of and between pens used for feeding and watering horses must have a minimum width of 3 feet. Two or more athwartship alleyways at least 18 inches wide must be left on each side of upper decks, so that the scuppers can be readily reached and kept clear of obstructions. For sheep and goats athwartship alleyways not less than 18 inches wide in the clear shall be left between pens and fore-and-aft alleyways 3 feet wide in front of each

pen, except that at obstructions and at ends of alleyways, as provided for cattle, there may be a minimum width of 18 inches. Sufficient space must be left at the sides of hatches to permit the feed in the hold to be readily removed and handled.

WOODEN STANCHIONS AND RUMP BOARDS.

Regulation 18.—Stanchions at least 4 inches higher than the required vertical space for cattle and horses must be of 4 by 6 inch clear hard pine or good sound spruce, set 6 feet from centers against the ship's rail, and inside stanchions in their proper place must be directly in line with outboard stanchions and set up so that the 6-inch way of the stanchions shall set fore and aft. A proper tenon, not less than 4 inches in length, shall be cut on the head of the same to receive the athwartship beam. A piece 2 by 3 inches, or 2-inch plank, shall be fastened to the outside of the stanchion and run up to underneath the rail to chock down the stanchion and prevent lifting when the beam is sprung to the crown of the deck. Open-rail ships shall be blocked out on backs of stanchions fair with the outside of rails to receive the outside planking. Where upper-deck fittings are not permanent, the heels of outside stanchions shall be secured by a bracing of 2 by 3 inch lumber from the back of each stanchion to sheer streak of waterway, the heels of inside stanchions being properly braced from and to each other. Bulwark stanchions must also be extra braced by raking shores running diagonally from the top of the stanchions to the deck.

Rump boards must be provided on all decks, and when covering bitts, rigging, or other obstructions located at a distance from ship's side must have fittings built 8 feet from said obstruction, with a solid partition built behind the cattle, not less than 5 feet high from deck, to prevent injury to the animals; and when necessary to extend fittings opposite bitts, etc., two or more cattle must be brought forward. Rump boards in such cases shall be 1½ inches thick. For horses wooden stanchions as above described must be placed at proper distances from each horse.

IRON STANCHIONS.

Regulation 19.—Iron stanchions may be used in place of wooden stanchions and shall not be less than 2 inches in diameter, set in iron sockets above and below, and fastened with ½-inch bolts. For horses the same number of iron stanchions are required as when wooden stanchions are used.

HOOK BOLTS OR CLAMPS.

Regulation 20.—Hook bolts or clamps must be made of ½-inch wrought iron, with hook on outboard end and thread and nut on inboard end to pass over and under rail and through outboard stanchion and set up on the inside of same with a nut. These bolts may be double or single. If double, no thread or nut is necessary, but the stanchion will lie shipped through it, thus double-hooking the rails. This will be found very useful where funnels or other deck fittings come in the way of beams passing from side to side of ship.

BEAMS.

Regulation 21.—Beams must be of good sound spruce or hard pine lumber, 4 by 6 inches, to run clear across the ship's beam where practicable. Should any house or deck fittings be in the way, the beams should butt up closely to the same. These beams shall have a 2 by 4 inch mortise to receive the tenon of each and every stanchion and to take the same crown as deck of ship by springing down to shoulder of outside stanchion and to be properly pinned or nailed to tenon and wedged tightly afterwards. The mortises shall be cut not less than 6 inches from outside ends of beams.

BRACES.

Regulation 22.—Diagonal braces shall be fastened on each stanchion on both sides of same, running up to top side of beam and properly secured by well nailing to both stanchions and beam.

HEADBOARDS.

Regulation 23.—Headboards shall be not less than 2 by 10 or 2½ by 9 inches, of good clear spruce or hard pine lumber, and secured at every stanchion by ½-inch screw bolts passing through same and set up with nuts. When 3 by 9 or 3 by 10 inch headboards are used, stanchions may be set at distances not exceeding 8 feet. Where headboards butt on the stanchions, a piece of iron one-quarter of an inch thick and 3 inches square shall be placed over the boards like a butt strap. These headboards shall have 1½-inch holes

bored through them at proper distances for tying the animals; provided, however, that on all open decks stanchions must not be placed more than 6 feet from center to center.

HEAD PIPES.

Regulation 24.—In place of wooden headboards two wrought-iron pipes, not less than 2 inches in diameter, may be used, placed 8 inches apart. Such head pipes must be made continuous by having a wrought-iron threaded collar securely fastened on the end of each length of pipe into which the next length may be inserted or secured. Both head pipes must be held in place by means of having wrought-iron straps bolted to each stanchion by four $\frac{1}{2}$ -inch bolts. The lower head pipe shall be fitted with movable clamps, holding a ring of suitable size, to which cattle may be tied. Said clamps shall be set at the proper distance apart, in accordance with these regulations, and fastened to the pipe with screws.

FOOTBOARDS.

Regulation 25.—Footboards shall be of wood and of the same dimensions as headboards, and shall be properly nailed or bolted to stanchions.

DIVISION BOARDS.

Regulation 26.—Division boards for cattle shall be 2 by 8 inch sound spruce or hard pine, and so arranged as to divide the animals into lots of four, except at the ends of rows, thus making compartments for this number all over the vessel. These division boards shall be fitted perpendicularly.

DIVISION PIPES.

Regulation 27.—In place of wooden division boards three wrought-iron pipes not less than 2 inches in diameter may be used, placed 6 inches apart athwartship, set in iron sockets above and below, and fastened with $\frac{1}{2}$ -inch bolts.

DIVISION BOARDS FOR HORSES.

Regulation 28.—Division boards for horses shall not be less than 2 by 9 inches by 8 feet, and shall be of sound lumber, planed, and placed horizontally between the horses.

FLOORING.

Regulation 29.—Ships with iron decks shall be sheathed with 1-inch or 2-inch spruce or hard pine, but if 1-inch lumber is used the foot locks shall be 3 by 4 inches and laid so that they will properly secure the 1-inch boards, thus preventing them from slipping and at the same time acting as foot locks by showing a surface of 2 by 4 inches. It is optional with the owners whether they permit sheathing to be used on their ships with wooden decks, or whether they allow foot locks to be secured to the deck, but it is absolutely necessary to sheath iron decks before putting down foot locks in order to fasten same. Cement, diagonally scored, $\frac{1}{2}$ inch deep, may be used on iron decks instead of wood sheathing, if the foot locks be molded in the same and bolted to the deck. If the flooring is raised on any of the decks, it shall not be less than 2 inches thick, with scantlings 2 by 3 inches laid athwartships on the deck, not over 18 inches apart, with 2-inch plank for flooring nailed to them.

FOOT LOCKS.

Regulation 30.—Foot locks shall be of good sound spruce, hard pine, oak, or other hard wood, size 2 by 4 inches, laid flat side down and fore-and-aft, placed 12 inches, 14 inches, 2 feet 2 inches, and 14 inches apart, the first one distant 12 inches from the inside of footboard. Where temporary fore-and-aft locks are used, they shall be filled in athwartships opposite each stanchion, properly secured to sheathing or deck, and secured by a batten of spruce or hard pine 2 by 3 inches thick to go over all from stanchion to stanchion. Pieces of 2 by 3 inches must be nailed on stanchion over batten to prevent floor raising. Where permanent foot locks, securely bolted to decks, are used, the athwartship braces between foot locks from stanchion to stanchion and batten may be omitted when the stanchion is securely fitted in iron socket bolted to the deck. When troughs are used, fore-and-aft foot locks will be placed 17, 16, 22, and 16 inches apart. A space of 2 inches may be left between the ends of athwartship foot locks and fore-and-aft foot locks when the former are securely bolted to the deck. When fore-and-aft foot locks are permanent, a 2-inch space shall be left between ends at end of each section. Vessels now fitted with 3 by 4 inch foot locks will not be required to use 2 by 4 inch foot locks except when the former are replaced.

OUTSIDE PLANKING.

Regulation 31.—All outside planking on open and closed rail ships must be properly laid fore and aft of ship and nailed to the backs of stanchions as close as possible for the cold season, and for the warmer months the top course planking shall be left off fore and aft of ship in order to allow a free circulation of air. Nothing less than 1½-inch spruce or hard pine is to be used for this purpose.

SHELTER-DECK PLANKING.

Regulation 32.—The planks to form the shelter deck, which must be erected on all exposed decks, shall be laid with 1½-inch sound spruce or hard pine lumber, sufficient to cover cattle. These planks shall be laid as closely as possible and shall be well nailed to the beams, thus making a good deck from which to work the ship's gear.

CATTLE FITTINGS OVER SPAR DECK.

Regulation 33.—No cattle fittings shall be erected over permanent spar-deck fittings forward and aft of the midship section until permission has been obtained from the Chief of the Bureau of Animal Industry.

UNDER-DECK FITTINGS.

ALLEYWAYS.

Regulation 34.—Alleyways on under decks shall be of the same dimensions as the alleyways of the upper decks.

STANCHIONS.

Regulation 35.—Stanchions on under decks shall be of clear hard pine or good sound spruce, 4 by 6 inches, set 6 feet from centers, so that the 6-inch way of same shall stand fore and aft and jammed in tight between the two decks, securely braced with 2 by 3 raking shores from stanchion to stanchion and sides of ship. If upper and lower decks are wood, then the stanchions set up between decks may be secured by well cleating to each deck at heads and heels of same.

HEADBOARDS, ETC.

Regulation 36.—Headboards, footboards, division boards, flooring and foot locks of the under decks shall be of the same dimensions and materials as those of upper decks and shall be fastened and arranged in the same manner.

TROUGHS.

Regulation 37.—Suitable troughs may be built on the footboards about 12 inches wide, when required for cattle, on either deck, by fastening footboards on outside of stanchions and fitting up on the inside. When it is desired to feed small grain or ground feed, the trough shall be raised above the decks to prevent the feed from becoming wet. Removable troughs must be used for feeding horses. Suitable troughs for grain and water must be provided on three sides of each sheep, goat, or hog pen.

PENS AT ENDS OF HATCHES.

Regulation 38.—When pens run up to the ends of hatches, two athwartship planks must be so placed as to prevent cattle from getting out of such pens.

PROTECTION FROM HEAT OF BOILERS.

Regulation 39.—No animals shall be loaded along the alleyways by engine and boiler rooms, unless the sides of said engine and boiler rooms are covered by a tight sheathing, making a 3-inch air space.

CASING FOR STEERING GEAR.

Regulation 40.—Suitable casing must be placed over the ship's steering gear when found necessary.

SHEEP AND GOAT PENS.

SHELTER DECK.

Regulation 41.—Only a single tier of sheep and goats may be carried on the shelter deck. Stanchions shall be not less than 4 by 4 inch spruce or hard pine set 5 feet on

centers, with 1½-inch shoulder to be gained on stanchions to receive rafters. Rafters shall be 3 by 6 inch spruce or hard pine set on edge and bolted to stanchions with ½-inch bolts. Planking shall be not less than 1½-inch tongued-and-grooved spruce or hard pine. Troughs must be constructed of three pieces of 1 by 6 inch lumber nailed together securely. Hayracks shall be made of 1 by 2 inch lumber and built in pens fore and aft and on athwartship partitions. Battens shall be nailed on the deck of the same dimensions as under deck, to act as foot locks. Battens on front and ends of pens shall be of 1 by 6 inch spruce or hard pine lumber and sufficient in number to properly secure the sheep or goats in the pens.

UPPER DECK.

Regulation 42.—Sheep and goat pens on upper deck shall be built with the same size and quality of lumber as cattle fittings upon upper deck. Flooring between tiers shall be of the same dimensions as under-deck fittings. Troughs and hayracks shall be the same as provided in Regulation 41.

UNDER DECK.

Regulation 43.—When the pens for sheep and goats on under deck are built for two tiers, joists not less than 3 by 4 inch spruce or hard pine must be used, supported in centers by 2 by 3 inch pieces run from deck to underside of joists securely nailed to same. The flooring shall be not less than ¾-inch tongued-and-grooved spruce or hard pine, and 1 by 2 inch battens shall be laid fore and aft on flooring, 18 inches apart, to act as foot locks. Stanchions may be made of 4 by 4 inch spruce or hard pine lumber. Troughs and hayracks shall be of the same dimensions as provided in Regulation 41.

VENTILATION.

Regulation 44.—Each under-deck compartment not exceeding 50 feet in length must have at least four bell-mouthed ventilators of not less than 18 inches in diameter and with tops exceeding 7 feet in height above shelter deck, two situated at each end of the compartment. Compartments over 50 feet long must have additional ventilators of the same dimensions or efficient fans.

SPAR DECK.

Regulation 45.—When the fittings on the spar deck are permanent and hatches overhead are provided, the same regulations for ventilation shall apply as provided for under decks.

THIRD DECK.

Regulation 46.—When it is desired to carry animals upon the third deck, written permission must be obtained from the inspector of the port. The vessel must be fitted as hereinbefore specified, lighted with electric lights, and properly ventilated. One set of ventilators should be trimmed to the wind and another set in the opposite direction. The ventilators must be tested and kept in easy working order.

HATCHES.

Regulation 47.—No cattle, swine, sheep, or goats shall be loaded upon hatches on decks above animals nor upon third-deck hatches when animals are carried upon such deck, nor shall any merchandise, freight, or feed for animals be loaded upon said hatches, but said hatches shall at all times be kept clear. In loading animals upon upper decks, four of the hatches shall be kept free of animals, one forward and one aft, and the intervening hatches must be so fitted as to afford an equalization of ventilation. Horses shall not be allowed upon any hatches under any circumstances.

No cattle shall be loaded upon any hatch where the coamings exceed 18 inches in height in center of hatch. There shall be not less than 5 feet 6 inches vertical space between the beams overhead and the flooring placed on hatches underfoot.

LIGHTING.

Regulation 48.—All vessels designated as cattle ships must provide at all times electric lights for the proper attending of all animals.

FEED AND WATER.

Regulation 49.—All vessels not provided with pipes for watering animals shall carry casks or hogsheads of not less than 400 gallons total capacity for each 100 head of cattle and horses, and an additional amount in equal proportion shall also be carried for sheep, and these shall be filled with fresh water before sailing and refilled as emptied. All water tanks for use of animals must be filled with good fresh water before sailing.

Each vessel shall carry water condensers which are in good working order and of sufficient capacity to provide 8 gallons of fresh cold water each twenty-four hours for each head of cattle, in addition to the amount required by other animals on board and for other purposes.

Regulation 50.—Not more than two days' feed for the animals shall be allowed to be carried on the shelter deck, and no feed shall be carried on the shelter deck when same interferes with the proper care of sheep; neither shall any feed be stored on top or inside of sheep pens. When feed as above provided is placed on the shelter deck, it must be properly covered and shall be the first feed used. All other feed shall be under hatches, and, so far as possible, shall be placed in the holds contiguous to the animals on board.

ATTENDANTS.

EMPLOYMENT AND CHARACTER.

Regulation 51.—The employment of all attendants shall be subject to the approval of the inspector of the port, and men so employed shall be reliable and signed as a part of the ship's crew and under the control of the captain of the vessel. They shall be furnished with well-lighted and well-ventilated quarters and with bedding and table utensils. Experienced foremen shall be in charge of the animals, and not less than one-half of the attendants must be experienced men who have made previous trips with stock.

The shippers of export animals, or their agents, shall make affidavit concerning the character of the attendants. The attendants shall be assembled a sufficient time before the sailing of the steamer for an employee of this Department to examine them. The examination shall be made before the signing of the ship's articles by the attendants, and any man who fails to conform to the following conditions shall be rejected: (1) The men employed must be able to speak English sufficiently to make themselves understood, or to understand orders given them; (2) they must know for what purpose they are employed and the duties that will be required of them; (3) they must be able-bodied and physically competent to perform the duties required; (4) each man entitled to return passage shall be supplied with return transportation before acceptance, unless he informs the inspector that he does not wish to return. The Department has no control over the return of cattlemen. Inspectors in charge of the ports are directed to carefully enforce the above regulations.

When attendants are found to be incompetent, intemperate, or otherwise unfit to properly care for the animals, the captain of the vessel is requested to report the fact to the inspector of the port.

CATTLE ATTENDANTS.

Regulation 52.—There shall be one attendant for each 35 head of cattle, not including foremen, upon steamers having water pipes extending the entire length of both sides of compartments; and upon steamers not so fitted there shall be one attendant for each 25 head of cattle shipped. Provided, however, that when all the attendants are experienced and capable men, there shall be one attendant for each 50 head of cattle upon steamers having water pipes extending the entire length of both sides of compartments, and not less than 3 feet in width of alleyways, if a competent watchman for night duty for each shipper is furnished in addition; and upon steamers not so fitted there shall be one experienced attendant to each 35 head of cattle shipped, together with watchmen as provided above.

SHEEP AND GOAT ATTENDANTS.

There shall be one man in charge of each 150 head of sheep and goats during the winter season (October 1 to April 1), and one to each 200 sheep and goats during the summer season.

HORSE ATTENDANTS.

For horses there shall be one attendant to each 22 head.

ADDITIONAL HELP.

There shall also be additional help furnished by the captain of the vessel when water has to be pumped by hand.

REST, LOADING, INSPECTION, CERTIFICATES, ETC.

REST BEFORE EMBARKATION.

Regulation 53.—No vessel shall be permitted to take on board any cattle, sheep, swine, or goats unless the same have been allowed at least five hours' actual rest in the yards

at the port of embarkation before the vessel sails, nor until the loading of the other cargo has been completed.

The phrase "actual rest" as applied to live stock in transit for export must not be interpreted to include any of the time occupied in unloading animals from the cars, or in their inspection, handling and roping, or in loading them on the cars again for transportation to steamer.

All animals must remain a sufficient length of time in stables or yards during daylight at the port of embarkation before the vessel sails for the purpose of inspection.

No vessel shall be permitted to take on board any horses which have been shipped over 500 miles unless the same have been allowed at least eighteen hours' actual rest in the stable or stables designated by the inspector for export horses at the port of embarkation before the vessel sails. Horses shipped less than 500 miles shall remain in such stables or yards as the inspector may designate not less than six hours for the purpose of inspection and rest. Horses shall not be placed upon steamers until the loading of the other cargo has been completed.

LOADING, ETC.

Regulation 54.—The inspector, or one of his assistants, shall supervise the loading of the animals and see that they are properly stowed, and, as far as practicable, tied; that a sufficient amount of good, wholesome feed is properly stowed; and that all the requirements of these regulations have been complied with. In case the regulations have not been complied with, he shall immediately notify the Chief of the Bureau of Animal Industry. In hot weather the tying of cattle may, in the discretion of the inspector, be in part omitted until after the steamer has cleared and is in motion.

CERTIFICATES OF INSPECTION.

Regulation 55.—The inspector at the port of shipment shall issue certificates of inspection for cattle, sheep, swine, and goats, which are to be exported to any foreign country, unless the Secretary of Agriculture shall have waived the requirement for such certificate of inspection for export to the particular country to which such animals are to be shipped. Each certificate shall cite the name of the shipper, the name of the consignee, and the destination. The certificates shall be issued in serial numbers; only one certificate shall be issued for each consignment, unless otherwise directed by the Chief of the Bureau of Animal Industry. The certificates shall be delivered to the chief officer of the vessel upon which said consignment of live stock is to be transported after the loading and stowing is completed, and continue with the shipment to destination, where it may be delivered to the consignee.

DEFECTIVE FITTINGS.

Regulation 56.—The inspector may, in case he finds that any of the fittings are worn, decayed, defective in construction, or appear to be unsound, require the same to be replaced before he authorizes the clearance of the vessel.

CLEANSING OF FALSE DECKS AND TEMPORARY TROUGHS.

Regulation 57.—False decks upon which cattle are loaded and temporary feed troughs must be removed and the manure and dirt cleaned from underneath before receiving another load of cattle.

HEADROPES, ETC.

Regulation 58.—Cattle shall be tied with $\frac{3}{4}$ -inch rope, which shall not be used more than once, and must be either manila or sisal.

All headropes, halters, blankets, stable utensils, feed bags, and feed troughs, if returned to this country, must be disinfected under the supervision of the inspector of the port unless an affidavit is furnished by the captain of the vessel that the same have been disinfected, describing the manner of disinfection, or unless such affidavit is furnished by the proper official at the port where the animals are unloaded.

INJURED ANIMALS.

Regulation 59.—Animals suffering from broken limbs or other serious injuries during the voyage shall be slaughtered by direction of the captain of the vessel.

(AMENDMENT NO. 7 TO B. A. I. ORDER NO. 137.)

Regulations Governing the Admission into Establishments Where Inspection is Maintained of the Carcasses and Meat and Meat-Food Products of Animals Which Have not had Post-Mortem Inspection by an Inspector of the Bureau of Animal Industry at the Time of Slaughter; the Interstate and Foreign Transportation of Imported Meat and Meat-Food Products; and the Interstate Transportation of Certain Meat and Meat-Food Products on Hand on October 1.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., December 5, 1906.

For the purpose of preventing the use in interstate commerce of meat and meat-food products which are unsound, unwholesome, unhealthful, or otherwise unfit for human food, under authority conferred upon the Secretary of Agriculture by the provisions of the act of Congress approved June 30, 1906 (34 Stat., 674), the following new regulations, and an amendment to the amendment to paragraph (j) of Regulation 50, are hereby prescribed for the transportation in interstate and foreign commerce of the meat and meat-food products of cattle, sheep, swine, and goats.

This regulation, which for the purpose of identification is designated as Amendment No. 7 to B. A. I. Order No. 137, shall become and be effective at once.

JAMES WILSON, *Secretary of Agriculture.*

Regulation 62.—Meat and meat-food products from the carcasses of animals which have not had post-mortem inspection by inspectors of the Bureau of Animal Industry at the time of slaughter will not, except as hereinafter provided, be admitted into establishments where inspection is maintained. The exception to this rule applies only to carcasses with the head and all viscera, except the stomach, bladder, and intestines, held together by natural attachments. Such carcasses, if offered for admission into an establishment where inspection is maintained, shall be inspected, and if found to be free from disease and otherwise sound, wholesome, healthful, and fit for human food, they will be marked "U. S. Inspected and Passed" and admitted into establishments where inspection is maintained. If found to be diseased, unsound, unwholesome, unhealthful, or otherwise unfit for human food, they will be marked "U. S. Inspected and Condemned," and the proprietor of the establishment where inspection is maintained will be required to destroy them for food purposes. This is an absolute requirement of the meat-inspection law and can not be waived or departed from in any instance or particular.

Regulation 63.—Establishments where inspection is maintained which also process or prepare imported meat or meat-food products will be required to conduct such processing or preparation in a building separate and apart from the building in which domestic meat and meat-food products are prepared under Department supervision. The Attorney-General, in opinion dated September 27, 1906, ruled that the meat-inspection amendment did not cover the transportation of imported meat and meat-food products. Therefore, imported meat and meat-food products which have not been mixed with or added to domestic meat or meat-food products may be exported to any foreign country without the certificate required by Regulation 45, as amended by Amendment No. 3 to B. A. I. Order No. 137. However, the collector of customs should require an affidavit that any such meat or meat-food product offered for export is in fact imported and not mixed with or added to any domestic meat or meat-food product.

Regulation 64.—Imported meat and meat-food product which has not been mixed with or added to domestic meat or meat-food product may be transported in interstate commerce. When any imported meat or meat-food product which has not been mixed with or added to any domestic meat or meat-food product is offered to any common carrier for transportation from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia as interstate or foreign shipment, the person, firm, or corporation offering such imported meat or meat-food product shall make the following certificate, in duplicate, and deliver the same to the common carrier:

Date....., 190 .

Name of carrier to which offered.....
 Shipper.....
 Consignee.....
 Point of shipment.....
 Destination.....
 Car number and initial.....

(Need not be given in the case of express companies or ships.)

The following-described meats or meat-food products are imported and have not been mixed with or added to any domestic meat or meat-food product, and are sound, healthful, wholesome, and fit for human food:

Description and weight of shipment.

 (Signature of shipper.)

The duplicate certificate shall be forwarded immediately by the initial carrier to the Chief of the Bureau of Animal Industry, Washington, D. C. The waybills, transfer bills, running slips, or conductors' cards accompanying a car containing a shipment of imported meat or meat-food product made under this regulation must have embodied in, stamped upon, or attached to the same a certificate in the following form by the issuing railroad company:

(Name of railroad company)-----

Imported meat and meat-food product not mixed with domestic meat or meat-food product, as evidenced by shipper's certificate on file with initial carrier.

(Signed)-----, Agent.

Regulation 50.—Paragraph (j) of Regulation 50, as amended by Amendment No. 4 to B. A. I. Order No. 137, is hereby further amended by inserting the words "and December" after the word "November" in the seventh line of the said paragraph and by inserting the words "and January, 1907," after the figures "1906" in the seventh line of said paragraph. The effect of this amendment is to add two months to the time during which sweet pickled, dry salted, smoked, and other similar meats, lard, lard compounds, lard substitutes, butterine, and oleomargarine which were on hand on October 1 may be inspected and passed and moved in interstate commerce.

(B. A. I. ORDER NO. 140.)

**Special Order Providing for the Importation of Canadian Animals for
Exhibition at the Jamestown Exposition, Norfolk, Va.**

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,

Washington, D. C., December 20, 1906.

It is hereby ordered, That Canadian animals, including horses, cattle, sheep, goats, and swine, may be imported into the United States for exhibition at the Jamestown Exposition, provided they are accompanied by a certificate of a Canadian official veterinarian stating that such animals are free from any contagious or infectious diseases and have not been exposed to the contagion of such diseases affecting each particular species for a period of three months preceding the date of shipment. All such animals must be loaded at a point of shipment in Canada into clean and disinfected cars for transportation to the United States, and a certificate from the railroad agent must accompany said cars showing that they were duly cleaned and disinfected in the manner prescribed in the regulations of this Department. Such animals must be entered at one of the designated animal quarantine stations (principal stations, St. Albans, Vt.; Buffalo, N. Y.; Detroit, Mich.; Port Huron, Mich.), and on their arrival the inspector of the Bureau of Animal Industry at said station will countersign the official veterinary certificate (or permit in the case of cattle) herein provided for and allow the animals, if found free from disease, to proceed to the Jamestown Exposition, subject to veterinary inspection at that point. All such Canadian animals must be loaded and shipped in cars in which they can and do have proper feed, water, space, and opportunity to rest, and must not be unloaded in any public stock yards or other point until they reach the Jamestown Exposition grounds.

Any person contemplating the importation of neat cattle from Canada must make application to this Department for a permit to import cattle for that purpose. Said application must give the number of cattle and a description of each, covering breed, registration number, and state at what point the cattle are to be imported and the names of the railroads by which and over which said cattle are to be transported to the

city of Norfolk, Va. This application must be accompanied by a certificate from a Canadian official veterinarian stating that no contagious disease affecting cattle, excepting tuberculosis and actinomycosis, has existed in the district in which such cattle have been kept for the past year, and that the cattle have been examined by him and are free from contagious diseases. The cattle of Canadian origin which are not sold to remain in the United States must be returned immediately to Canada at the close of the exhibition. All such cattle that are to remain in the United States must be tested with tuberculin by an Inspector of the Bureau of Animal Industry, and will not be allowed shipment to destination in the United States unless such test shows them to be free from tuberculosis.

JAMES WILSON, *Secretary of Agriculture.*

(B. A. I. ORDER No. 141.)

Special Order Providing for the Importation of Animals other than Canadian for Exhibition at the Jamestown Exposition, Norfolk, Va.

U. S. DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., December 20, 1906.

It is hereby ordered, That horses from Great Britain and the Continent of Europe may be imported into the United States for exhibition at the Jamestown Exposition, provided they pass a veterinary inspection by an Inspector of the Bureau of Animal Industry at the port of entry.

It is further ordered that the quarantine period for cattle imported for this Exposition from Great Britain, Ireland, and the Channel Islands shall be sixty days, counting from the date of shipment. Cattle imported from the Netherlands and Belgium will be subjected to a quarantine of ninety days, counting from the date of sailing. The period of quarantine for sheep and other ruminants and swine shipped from the above countries shall be fifteen days, counting from the date of arrival at the port of entry.

Any person contemplating the importation of cattle, sheep, and other ruminants and swine for exhibition at this Exposition must make application to this Department for a permit to import and quarantine said animals for that purpose. This application must state the number and kind of animals to be imported, the port from which shipped, and the probable date of shipment, and must further state the port at which said animals are to be landed and quarantined and the approximate date of their arrival. United States consuls will not give clearance papers or certificates for the shipment of animals from their districts unless the importer presents a duly signed permit issued by this Department covering the shipment.

The regulations of this Department governing the inspection and quarantine of horses, neat cattle; sheep, and other ruminants and swine imported into the United States will govern generally in the care and supervision of such animals in their shipment from the port of entry to the animal quarantine station and after arrival at such station. The certificates of health provided for in the above regulations will also be required for animals imported for this Exposition. All cattle covered by the provisions of this order may be imported without a tuberculin test, provided that after the expiration of the quarantine period they are shipped directly from the animal quarantine station to the Exposition grounds without unloading in any public stock yards or other point en route. After the close of the Exposition, however, if such cattle are to remain in the United States, they must be tested with tuberculin by an Inspector of the Bureau of Animal Industry, and will not be allowed shipment to destination in the United States unless such test shows them to be free from tuberculosis.

JAMES WILSON, *Secretary of Agriculture.*

REPORT OF THE DEPARTMENT COMMITTEE ON THE FEDERAL MEAT-INSPECTION SERVICE AT CHICAGO.

DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., April 5, 1906.

The Secretary of Agriculture:

SIR: I submit herewith the report of the committee authorized by your letter of March 2 and my instructions of March 6 to proceed to Chicago, Ill., for the purpose of conducting an investigation with particular reference to the manner in which the meat-inspection work is carried on at that place. This investigation was considered necessary on account of the discussions during the past several months regarding the conditions existing at the Union Stock Yards and the packing houses in Chicago and the inspection conducted by the Bureau of Animal Industry which have appeared in different medical journals and which were brought about by the statements of certain persons who had apparently made only a superficial inquiry and garbled the regulations of the Department. On this account it was thought advisable that a thorough and complete investigation should be made by a committee competent to pass upon the whole subject. This report is very complete and detailed, as it was desired to make every phase of the subject clear and distinct, so it would not be misunderstood and misconstrued. Careful attention was given to the personnel of the committee, so that its report could be received without question. Doctor Mohler is chief of the Division of Pathology of the Bureau and is eminently qualified to pass upon all questions pertaining to the fitness of meat products for human food. Doctor Steddom, as chief of the Inspection Division of the Bureau, is familiar with the modus operandi of the regulations governing the inspection, and Mr. McCabe, solicitor of the Department, is thoroughly competent to pass upon all legal aspects of the work and also to criticize the work from the view point of a layman, and one not so familiar with packing-house methods as the other members of the committee.

From personal observation I know that sanitary conditions at abattoirs where this Bureau maintains inspection, while not always satisfactory, are much superior to those at the average establishment without such inspection. I know, further, that many diseased animals are not shipped to market centers where inspection by the Bureau is maintained, but are disposed of in other ways. In my opinion it is most important that the inspection should be extended as rapidly as possible (if the appropriations permit such extension) in order that the avenues for the disposal of diseased animals be reduced to a minimum. The demand for inspection at establishments not having such inspection has been much greater than the Department has been able to meet on account of the limited appropriation, and for the same reason it has not been possible to increase the efficiency of the service as rapidly as is desirable.

It might be well to state here that in any slaughterhouse, no matter how sanitary the conditions may be, there is much that is revolting to one unaccustomed to such sights, and one who visits them must expect to witness scenes of blood and offal and to have his nostrils offended by disagreeable odors, as well as to see finely dressed beef and mutton and tempting hams and bacon.

Among the misleading statements published was a weekly report of the condemned animals and carcasses made by the inspectors of the city of Chicago, which report included the total number of animals and carcasses condemned by the city and State inspectors and by the inspectors of this Department. No credit whatever was given to the work done by the State and by this Department. In view of the fact that meat inspection by the city at the stock yards had been entirely discontinued for some months, it was assumed that the total number of condemnations reported by the recently appointed city inspectors was additional to the work done by the State and Government. As a matter of fact, the greater number of condemnations were made by employees of this Department. The committee ascertained that the city inspectors had no definite printed instructions governing their inspection, and for this reason differences of opinion frequently arose between the local inspectors and the others as to which animals should be condemned and which passed. This matter, however, has been satisfactorily adjusted, and an agreement has been made between the officials of Chicago and this Department whereby the regulations of this Department shall be accepted in all cases. This agreement is highly satisfactory, as more good can be accomplished when hearty cooperation exists than when there is friction.

The recommendations of the committee are fully approved. Wherever this report has indicated a weakness in the system of inspection, steps will be taken to strengthen the same; and while authority is lacking to enforce certain sanitary measures, I shall be

governed by your verbal order that when proprietors refuse to place their establishments in a sanitary condition the withdrawal of inspection will be recommended. One such withdrawal of inspection has already been made for noncompliance with amendment No. 5 to B. A. I. Order No. 125, and I am advised that every effort is now being made by the proprietors of the establishment to comply with the Department regulations, in order that the inspection may be resumed. When these requirements are complied with the inspection at that establishment may be again put in operation.

Regarding the microscopic inspection, I am informed that negotiations are now underway between this country and Germany with the object of eliminating this inspection, either in this country or in Germany, as it does not seem to be essential to make the inspections twice.

I wish to emphasize the fact that in all establishments where inspection is conducted by this Department (not, however, considering microscopic inspection in this connection) all animals slaughtered therein are subject to the same inspection, and all condemned carcasses or products are subjected to the same treatment, whether the meat is intended for local, interstate, or export trade.

Very respectfully,

A. D. MELVIN, *Chief of Bureau.*

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SOLICITOR,
Washington, D. C., April 3, 1906.

The Chief of the Bureau of Animal Industry.

SIR: The committee appointed to investigate and report upon the condition of the meat-inspection service of the Bureau of Animal Industry at Chicago, the relations subsisting between the meat-inspection service of the Bureau and the meat-inspection service of the city of Chicago, and the sanitary conditions of the abattoirs at Chicago, has completed its work, and submits the following report:

The committee left Washington on Saturday, March 10, 1906, began the inspection of the abattoirs at Chicago on Monday, March 12, and continued the work until Thursday, March 22. All abattoirs in Chicago having Government inspection and two abattoirs which do not have Government inspection, including each building, department, and room thereof, were visited by the committee and fully inspected. The visit of the committee to any particular abattoir or portion thereof was unannounced. No communication was had with the proprietors of abattoirs or their agents, with one exception, which will be referred to in the body of the report; and the plan pursued by the committee was to call at the abattoir and select a Government employee, stationed at that plant and familiar with every part of the plant, to guide the committee.

The report is full and complete, and describes the actual conditions existing in the various establishments at the time of inspection. No fact or condition has been minimized or distorted.

It is proposed in this report to describe—

1. The ante-mortem meat-inspection service of the Bureau of Animal Industry at Chicago.
2. The Federal post-mortem inspection of meat, including the microscopic inspection of pork, with all the necessary processes connected therewith.
3. The meat-inspection service maintained at Chicago by the State of Illinois.
4. The meat-inspection service maintained at Chicago by the city of Chicago.
5. The Government supervision of canned products.
6. The sanitary condition of each establishment.
7. The legal phase of the question, including the scope of authority now possessed by the Government, by the State, and by the city.
8. The conclusions and recommendations of the committee.

THE ANTE-MORTEM MEAT-INSPECTION SERVICE OF THE BUREAU OF ANIMAL INDUSTRY
AT CHICAGO.

The Union Stock Yards at Chicago, Ill., in which ante-mortem inspection of live stock is conducted by the employees of the Bureau of Animal Industry, contains 500 acres, about 50 of which are either covered by buildings or used for the storage of manure, lumber, etc. This latter portion, commonly known as "the dump," is the only area which is not paved or covered with flooring. Of the remaining 450 acres, an area comprising a very few acres—which includes the pens that are scarcely ever in use—is floored with planking and drained by box sewers. The remainder of the cattle pens, roadways, and alleys comprising the vast area in daily use is paved throughout with vitrified brick having a low degree of water absorption. The moving of an office building permitted the

committee to observe that the bricks adjacent to this structure were put down upon a substantial foundation. The drainage is good, and the pens are kept as clean as the character of their use would permit.

The ante-mortem inspection at these yards is conducted under the provisions of B. A. I. Order No. 125 and amendments, promulgated by virtue of the authority conferred upon the Secretary of Agriculture by law. This order and amendments require that an ante-mortem examination shall be made of all animals arriving at public stock yards and intended for slaughter at abattoirs at which the Department has established inspection. All animals found upon such examination to be affected with any of the diseases or conditions named in amendment No. 6 to B. A. I. Order No. 125 shall be rejected, subject to final disposition, and so marked or otherwise rendered identifiable as to facilitate their proper disposition. Rejected animals intended for slaughter at an official abattoir are required to be removed by the owners from the pens containing animals which have been inspected and found to be free from disease, and are disposed of in accordance with the laws, ordinances, and regulations of the State or municipality in which said rejected animals are located and, when possible, under the supervision of an inspector of the Department. It is the custom at the Union Stock Yards at Chicago for the inspectors to place in the ear of each rejected animal a metal tag bearing the words "U. S. Rejected" and a serial number, and, in some instances, to further mark such animals by clipping a portion of the hair, to insure their identification in case the tag is removed. This method of identification applies to animals other than cattle rejected in the yards on account of being affected with actinomycoasis, or lumpy jaw. Cattle suspected of being thus affected are tagged by inspectors of the State of Illinois and are afterwards slaughtered at an official abattoir under the supervision of Federal and State and city officials.

The ante-mortem inspection of live stock is highly important and a valuable safeguard to the health of the meat consumer, as there are certain diseases and conditions not attended by any gross lesions in the carcass albeit they are noxious and repugnant. Direct proof of this is found in the literature of meat poisoning, the great majority of which cases could be directly traced to eating the meat of cattle slaughtered in emergency without any noticeable changes being observed in the tissues on post-mortem examination. The interests of the live-stock industry are also protected by this examination, since none but healthy animals which have not been exposed to any infectious disease are permitted to be shipped from the Union Stock Yards to the farm as breeders and feeders or to the abattoirs of other cities not having Federal inspection. The rigorous character of this inspection before slaughter is indicated by the fact that ante-mortem rejections average about twice as many as the post-mortem. A brief description of the condition of each rejected animal is recorded on a permit signed by the yard inspector, which permit is delivered to the abattoir inspector in order that the animal may be properly identified on the killing floor. It is then held for final disposition on post-mortem examination, with the exception of those animals that have been rejected for advanced pregnancy and recent parturition. These latter may be held until they have fully recovered from the parturient state (ten days) and then slaughtered; or in case they are not affected with, or have not been exposed to, any infectious disease they may be sold for stock purposes.

Those animals that have been tagged on ante-mortem examination and which do not on post-mortem show sufficient lesions to warrant condemnation are, in general, passed for food, while all carcasses not fit for consumption are tanked. However, there are a number of diseases in which the determination of the healthfulness of the meat must depend entirely on the post-mortem examination, and many animals are condemned at this stage which have passed ante-mortem inspection. Thus the importance of these two associate methods of inspection is exemplified.

The average number of Federal inspectors engaged in ante-mortem inspection at the yards above referred to is 31, and the numbers of animals inspected by them during the calendar year 1905 were as follows: Cattle, 4,673,846; sheep, 4,687,835; swine, 11,537,514. The number of animals rejected at the yards on ante-mortem inspection during the calendar year 1905 were as follows: Cattle, 17,891; sheep, 1,243; swine, 26,138. The numbers of rejected animals slaughtered at official abattoirs were: Cattle, 11,459; sheep, 286; swine, 13,672; and the numbers passed on post-mortem inspection were: Cattle, 8,725; sheep, 267; swine, 12,719; while the numbers condemned were: Cattle, 2,734; sheep, 19; swine, 953. The condemnations of animals tagged on ante-mortem inspection, however, are only a small percentage of the carcasses condemned by Federal inspectors, as it is impossible to detect certain diseased conditions except upon post-mortem examination. In all there were condemned during the year 1905 at Chicago, 9,480 carcasses of cattle, 934 of sheep, and 48,223 of hogs.

THE POST-MORTEM INSPECTION OF MEAT, INCLUDING THE MICROSCOPIC INSPECTION OF PORK, WITH ALL THE NECESSARY PROCESSES CONNECTED THEREWITH.

The number of establishments at Chicago at which Federal post-mortem inspection is maintained is 22 in all, and they are officially designated by abattoir numbers. The total number of animals slaughtered at the various abattoirs during the calendar year 1905 was:

Abattoir.	Animals slaughtered.		
	Cattle.	Sheep.	Swine.
A	410,811	398,851	451,425
B	506,268	852,404	1,505,145
C	561,862	1,064,887	1,147,807
D			
E	352,486	533,561	417,875
F	31,977	89,056	641,309
G	89,291		
H			
I	595	60	222,292
J			595,657
K	31,898	29,202	350,787
L			15,241
M	33,028	45,120	8
N	25,216	23,992	
O	17,594	49,199	17
P			
Q			
R			1,559
S	6	1	177,691
T	7,458	3,348	
U	265,389	316,770	525,077
V			
Total	2,333,879	3,346,451	6,051,835

The number and grade of Federal employees detailed for duty at the various establishments at the time of the committee's investigation are indicated by the following table:

Number and grade of Federal employees on post-mortem inspection.

Abattoir.	Inspectors.	Assistant inspectors.	Stock examiners.	Taggers.	Laborers.
A	2	2 ^a	8	5	
B	3	3	2	7	
C	2 ^a	^a	6	7	1
D ^a					
E	1	2	2	5	
F	1 ^a	1	2	8	
G	1 ^a		1	2	
H	1 ^a	1	1		
I ^a	1	2	1	2	
K	1 ^a	1	1	2	
L	2				
M ^b					
N	^a	1	2		
O	^a	1	1		
P	^a		2		
Q ^a					
R	^a				
S		1			
T	1 ^a	1			
U	^a	1	1		
V	1	2	2	8	
W			2		
Total	20	20	29	36	1

^a Two abattoirs located in the same building.

^b Not in operation.

The fractional figures shown in the above table indicate that some of the employees divide their time between two or more establishments.

Some 85 assistant microscopists are also engaged in examining pork intended for shipment to foreign countries requiring such examination.

It may be of interest to know how the Federal organization of employees is systematically working in the post-mortem examination of the food-producing animals, the products of which are intended not only for export and interstate traffic, but for local consumption as well. At this point it should be remembered that in all abattoirs having Federal inspection the entire meat product, even though it is intended for consumption within the State, is inspected by the Government inspectors.

In making the post-mortem examination of hogs two systems of inspection are in force. One method is adapted to the smaller abattoirs, where the number of hogs killed per hour is comparatively small. One inspector, from the position he assumes on the bench beside the workman who eviscerates them, can readily inspect all these carcasses. He is afforded plenty of time in these houses to make a thorough examination of the cervical glands after the carcass comes off the scraping bench before it is opened for evisceration, and then to inspect the viscera of this carcass as they are thrown on the table at his side.

The second method is in vogue at the larger abattoirs, where the killing numbers from 300 to 500 per hour. In these houses the hogs are driven to the catch pens, a chain is passed around a hind leg of one of the animals and attached to one of a series of constantly moving arms on a so-called "Ferris wheel," which elevates the pig from the pen and places it on an inclined rail. The struggles of the animal carry it before the "sticker," who makes a small incision in the throat, severing the large blood vessels. When the animal dies the body is placed in scalding water and then pulled through an ingenious scraping machine, where most of its hair is removed. The scraping is completed by men along the scraping bench, after which the head is cut almost away from the body and the first inspector, termed the "head inspector," standing alongside the "header," examines, either by palpation or sectioning with a knife, the cervical lymph glands of every carcass. This inspection is principally to detect the presence of tubercular infection that might inadvertently pass by the second, or visceral, inspector, because the lesions are not very prominent. Frequently it brings to light incipient cases which show the lesions only in the glands of this region. The importance of this inspection is shown by the fact that of 98,500 tubercular hog carcasses, reports of which were tabulated for this purpose, 92 per cent presented lesions of these cervical glands. In case any alteration is observed or felt by the head inspector a previously devised mark is made—usually a condemnation card attached by means of a hog ring and ringer—for the purpose of attracting the special attention of the inspector on the gutting bench to this particular carcass. Two or three such ringers with condemnation tags attached are kept within easy reach, so that several carcasses may be tagged in succession and without delay. The hog is then passed from the scraping bench, together with the normal carcasses, and is hung on the track of a suspended tramway, along which it passes to the gutting bench. The carcass is here eviscerated, and during this process carefully examined by the visceral inspector, who is placed at such a point on the killing floor that all the eviscerating goes on directly in front of him and so near that he can examine with his hand any lesion that his eye may detect. His position also commands a view of the hogs before they reach him, and of the line after the carcass has passed onward. Beside him is a slightly inclined conveying trough, down which pass the various organs in close proximity to him. These two inspectors are relieved during the day. In cases where lesions are apparent the viscera, together with the carcasses, are tagged and switched to a special rail in the cooling room. Before the ultimate disposition of these tagged carcasses is determined upon, more elaborate and final examination is made by a third inspector. The healthy carcasses are passed along the rail through the shower bath to the hanging floor.

In addition to the regular ante-mortem and post-mortem inspections of hogs, a microscopic examination for trichinæ is made of all swine, the products of which are for export to those countries that demand this inspection before admitting such meats.

It is plain that this microscopic inspection is chiefly a commercial matter, and that it was instituted for the purpose of regaining an export market for American pork products which had been excluded from certain European countries. This it succeeded in accomplishing, and the demand for microscopically examined pork increased rapidly until semi-prohibitive regulations were again enforced by the country receiving the most of these products. At the present time all pork entering Germany is reexamined at the port of entry at the expense of the shipper, and it is the opinion of this committee that either the microscopic examination in this country should be discontinued or the expense incurred should be paid by the trade which it benefits.

Much criticism has been aroused by the fact that the United States Government pays for the microscopic inspection of pork for foreign countries but permits our own citizens to consume the flesh of hogs not so inspected. As 1½ per cent of the microscopically examined hogs are found to be trichinous, it is argued that the American public consumes a like percentage of trichinous pork from uninspected hogs. It is further argued that,

although Americans cook their pork and thereby render the parasites harmless, nevertheless it would be more agreeable to eat meat free from trichinae. However, to carry out the microscopic examination of the carcasses of all hogs slaughtered in official abattoirs would require an appropriation of \$4,110,000 for this purpose alone.

The microscopic inspection is made as follows: After the hog has passed the ante-mortem and post-mortem examination the carcass is moved to the cooling room, where three samples of muscle are taken by a Government employee from the region of the shoulder, from the diaphragm, and from the tenderloin. Where the tongue is to be exported a sample of this organ is likewise taken for special examination. The specimens are placed in a small tin box, which contains a duplicate tag of the one fastened upon the carcass from which the samples were taken. The boxes are then placed in large metal cases provided with locks and taken to the microscopic room, where the samples are carefully examined by the microscopist and his assistants. In Chicago a force of 85 assistant microscopists, under the supervision of a chief microscopist, are employed for the inspection of pork for trichinae. Small portions of each of the three muscles are snipped off and prepared by mincing into three thin, evenly distributed, translucent mounts, held together in a compressor. Each preparation is then examined separately under low magnification by placing it in a frame on the mechanical stage of a microscope. By means of a specially constructed stage this frame, which holds a compressor, is made to run up and down on two parallel grooves, and, by means of a saw-tooth arrangement at the bottom and top of the stage, the compressor is forced onward with mechanical precision, so that each field overlaps another. Therefore every portion of the preparation must necessarily be in the field at some time during the examination. No microscopist is permitted to examine more than 80 slides a day, and the work performed is always subject to reexamination by the persons in charge of this work. The microscopist in charge makes a written report to the chief inspector at Chicago daily, giving the results obtained by this examination, together with the numbers of all carcasses rejected. In case living trichinae or nondisintegrated dead trichinae are found in the mounts, the sample is marked "C," and as soon as this report is received by the employee whose duty it is to mark rejected and condemned carcasses and to supervise their removal and disposition he marks the carcass with a condemnation tag and brands the letter "C" upon each ham, shoulder, and side. All these class "C" carcasses are taken from the cooling room and rendered into lard, at a temperature not lower than 220° F., or made into cooked-meat products, if the temperature is maintained at the boiling point a sufficient time to cook thoroughly the interior of the pieces. In case it is desired to have the meat of a carcass cured before being cooked, it is marked with twine and seals for identification. Those preparations in which are found degenerated or calcified trichinae cysts, or any substance which causes the least suspicion owing to its similarity to the above, are marked "B," and the carcasses represented by these preparations are branded with the letter "B" upon each shoulder, side, and ham of each carcass. The meat of the "B" carcasses is withheld from shipment to those countries that require a microscopic inspection, although free to be used in other trade. When the microscopist has found no trichinae, trichina-like cysts, or other suspicious bodies, the preparations are marked "A," and the carcasses represented are used for filling orders from those countries demanding trichina-free pork.

Before this microscopically examined meat is taken out of the cooler to be cut up, all the rejected carcasses must be withdrawn and placed by themselves, to be treated as above mentioned. All other meats in the cutting room are put away, and the tables, chutes, blocks, and carriers cleared of all pork previously handled. The cutting up of the meat is then begun under the supervision of a Government official, after which it is placed in a cellar, there to be cured, stored, packed, and stamped prior to shipment as trichina-free products. No other meats are allowed in this cellar, which is securely locked, and the key retained by one of the Government employees, who keeps an exact list of all meats coming into and going from the cellar. Sausage and other products of a similar nature, which are prepared from microscopically inspected meats, are kept during the process of dripping, drying, chilling, and smoking in separate rooms provided with locks the same as the microscopic cellars, and when they are removed for washing or other preparation a seal is affixed for the purpose of identification. A record by weight is kept of all such meats in order to prevent any but passed products from being used. When the microscopically inspected pork has been cured, smoked, or otherwise prepared, it is packed in barrels, boxes, or other packages, upon which purple meat-inspection stamps are placed in grooved spaces and covered with tin, to prevent them from being scraped off in transit. A purple certificate of inspection is then issued by the inspector in charge, stating the consignor, the consignee, destination, and description of the packages and the numbers of the purple stamps thereon.

The only establishments in Chicago that handle microscopic meat are abattoirs 1, 2, 3, 5, 22, 24, 35, 36, and 46. Owing to the great decrease in the demand for these products by the countries requiring microscopically inspected meats, only six of the above houses

were engaged in preparing these products for the market. The manner of handling microscopic meat in abattoir 15 is typical of the methods employed in the other establishments, and therefore the following description will suffice for all:

On receiving the report from the microscopist in charge, showing the number of hogs examined and the number of "B's" and "C's" detected, the Government employee at the abattoir at once picks out these trichinous carcasses and brands them as described above. The work of cutting the remaining carcasses which are free from trichinae or trichina-like bodies is usually performed at the commencement of the day's work or at the closing of work in the afternoon, and under the supervision of a Department employee. In the latter case a stop of a few minutes is made in order to permit the clearing of the benches, chutes, trucks, etc., of all meats from carcasses that have not been microscopically examined. The cut pieces which are to go to the microscopic cellar are conveyed by chutes to the floor below, where it is the duty of a second Government employee to watch the work and prevent the substitution of other meat. After these cuts have been salted they are taken to the microscopic room, which is provided with a padlock and key, in possession of this employee of the Bureau. In this establishment all the trimmings are taken to the room above the killing floor on a belt conveyer. This is arranged so that the Government man can stop it at will by dropping a gate. This, he states, he always does as soon as the work with the microscopic meat is finished, holding the conveyer closed until the trimmings which have gone up have been disposed of. After the trimmings are handled upstairs they are sent down again through a chute into a truck and taken to the sausage room. When the sausage has been made it is taken to the microscopic sausage drip room, which is kept locked, with the key in the possession of the Government employee.

A daily report is made by the Government employee at the abattoir to the Inspector in charge of the station regarding all microscopically examined hogs handled by him. In addition, the employees each keep a book record at their office for reference; these show the date the samples are taken, the number taken, with tag numbers, the date passed carcasses are cut, the number of rejected "B" and "C" carcasses, with the tag numbers, and the disposition of the same, with dates. A monthly report, which is a summary of all daily reports of that month, is also forwarded to the Inspector in charge by the Government employee at this abattoir. All microscopic rooms are locked, and the keys are in the hands of Government men; but there are only two such employees in charge of the work at this establishment, and there are some fifteen rooms to be looked after. It is the custom, therefore, for the employee to unlock in the mornings all the doors to the rooms in which work is to be performed by the packers.

All cuts of meat are both counted and weighed into and out of the Government cellars, and a record is kept of each such movement of meat. The employee in charge of the work at this establishment stated that he had 500,000 pounds of dry salt product and 200,000 pounds of sausage to look after. He is assisted by a tagger, whose duties are to take microscopic samples, watch the handling of microscopic meat, seal cars, issue stamps, and keep a general lookout for these products.

In these abattoirs all the microscopic compartments, which include the dry salt cellars and the rooms where the microscopic sausage is stored and handled during the various processes of curing, are under the immediate supervision of Federal employees, as above shown. In all the doors leading into these microscopic rooms are manholes, or gates not under lock and key; these, it was stated, had been provided in order to meet a requirement of the fire underwriters.

As there has been more or less discussion and adverse criticism regarding the large number of beef carcasses which the Federal Inspector examines each day in some of the larger packing houses in Chicago, it may not be out of place to give a brief description of the system adopted in such abattoirs and the methods which make it possible for the inspectors to inspect carefully and efficiently the entire killing. The cattle are driven up to the knocking pens, and the work of knocking begins immediately, except in a comparatively few cases where the Jewish method of shechtering is carried out. A lever is then pulled, which causes the floor of the pen under the stunned animal to tilt simultaneously with the lifting of the door, which permits the animal to roll out on the killing floor, a distance of about 2 feet below the level of the knocking pens. This distance has been greatly exaggerated inferentially by some writers, but the fact remains that a fall of any considerable distance would so bruise the carcass as to lower its market value, and in no case did the committee find that this distance exceeded 2 feet. The animal is now shackled, hoisted on the rail of an overhead tramway, and while hanging is bled by the stickler. After having been bled sufficiently it is pushed along the bed to a place where the headers skin the head and disarticulate it. The head is then placed on a specially inclined rack in such a position as to be identified readily should cause for condemning the carcass be found. The animal is now lowered and skinned, a constant string of butchers following one after another in completing the work and turning out

the dressed carcass. In the large abattoirs in Chicago there are from 16 to 28 beds. These beds are the portions of the killing floor opposite to each knocking pen, on which the animal is bled, eviscerated, and dressed. They are arranged in a continuous series, the first workman starting out on the first bed and going down to the last, by which time the last workman has completed No. 1 carcass, which is then pushed back on the rail out of the way for the next run. In this manner a force of men in one of these abattoirs may kill and dress about seven runs of cattle in an hour, which means an average of from 110 to 200 beef carcasses per hour, but never from 400 to 500, as has been erroneously stated by certain writers. The Federal inspector takes his position beside the butcher who eviscerates the carcasses and passes down the line with him, watching, feeling, and examining all suspicious indications. After two and one-half hours of this work he is relieved by another inspector, who is likewise supplanted by the first inspector after another two and one-half hours of labor. Surely such an inspection, made by a man skilled in his line of work, will enable him to find any lesion or condition which is sufficiently extensive or repulsive to warrant condemnation; and his ability to perform this task is no more remarkable or startling than the accuracy, deftness, familiarity, and speed which we expect from any other skillful and experienced person in another vocation.

Some persons have thought that this post-mortem inspection must be superficial, their misgivings being due merely to the fact that one or two inspectors could examine such a large number of carcasses per hour. Unlike the old method of individual slaughter in vogue in many foreign abattoirs, where the inspector examines the animal while it is being slaughtered, bled, eviscerated, and dressed by one or two butchers, the method of handling the carcasses in Chicago is according to the division-of-labor system, and unfamiliarity with these methods may probably account for the incorrect views regarding this inspection. The foreign method of slaughter is not conducive to the performance of such a vast amount of work as in this country. Thus the method of killing a steer by the percussion mask requires more time than would be consumed in killing eight similar animals with a sledge hammer, and the inhumanity that has been charged against this method, owing to the very infrequent necessity of striking more than one blow, would be more than offset by the fright and struggles of our range cattle caused by fastening the mask to their heads. In the German abattoir the inspector usually has his own laboratory, and much of his time is occupied in preparing tissues and in the microscopical diagnosis of lesions upon which he may desire information. In Chicago, as in other cities having inspection, the time of the inspector is wholly occupied in making gross examination, and thereby he is enabled to inspect a much larger number of carcasses than if it were necessary for him to spend a portion of his time over microscopic or bacteriologic study of suspected tissues. In case such an examination is necessary, the carcass is at once tagged and placed in an isolated compartment, specimens of the organs and affected tissues are expressed to the Chief of the Bureau for investigation; and if an exceptional case, the disposition of the carcass may be determined on obtaining the diagnosis. Lesions concerning which a confirmation of diagnosis is desired, or other information regarding their nature is requested, are likewise sent to Washington for examination.

When disease is observed in a carcass, a tag bearing the words "U. S. Condemned" is immediately attached to it with a lead-and-wire seal. The head, tail, and caul fat pertaining to it are secured and similarly condemned. After the condemned carcass has been halved it is placed, with the viscera, in a special room of the building, called the retention room, which is reserved for condemned meats. When a difference arises between the abattoir management and the inspector, the carcass bearing the condemned tag and seal is isolated and the decision of the inspector in charge is obtained. This decision is final except where a laboratory diagnosis is necessary.

In case the inspection has not revealed any disease, the carcass is trimmed of the ragged pieces of flesh and the spinal cord, the blood worked out of the large blood vessels of the forequarters, and the meat washed with hot water and dried with towels or by a forced draft of air. The carcass is then marked by placing a gelatinized label bearing the words "U. S. Inspected" and a serial number in indelible ink, or by a brand containing the abattoir number and the letters "U. S." on each quarter of all carcasses intended for export, and on the brisket, plate, flank, round, and chuck of each half of carcasses intended for local or interstate trade. These marks signify that the meat has been carefully inspected according to law and is considered fit for food. Exceptions to these methods of labeling healthy meat are made with those carcasses that are intended for the cutting room or that are to be used for canning purposes. When either carcasses or meat are shipped to another official abattoir for canning or other purposes, shipments are made in cars sealed and tagged on both sides, and the inspector in charge of the abattoir at destination is notified of the number of pieces or weight of the shipment, the number and initials of the cars, and the routing. To all packages, cans, barrels, firkins,

boxes, canvas, or other wrappers containing meat products from inspected carcasses, labels are attached showing the number of the official abattoir where they originated and declaring that the contents have been inspected according to act of Congress. When the chief inspector is satisfied of this fact, he has all packages intended for shipment properly marked with the white-meat inspection stamps bearing serial numbers. This work is performed by employees of the abattoirs under the supervision of an official of the Department.

Calves and sheep are inspected both ante-mortem and post-mortem under the same conditions and in practically the same manner as the animals already mentioned.

The facilities for the inspection of the various carcasses were noted at each of the abattoirs. In the hog house of abattoir No. 1, both the inspector of heads and the visceral inspector could perform their duties by natural light on the day of our visit, although artificial light is required by the latter on cloudy days. The final inspection of hog carcasses is conducted by natural light. The condemned carcasses are cut down and placed in trucks stamped with the words "U. S. Condemned Meat;" these trucks are used only for the purpose of conveying rejected carcasses to the tanks. The beef house of this firm has a killing floor which is supplied with more than the average of natural light, although during cold weather there is so much steam that artificial lights are required. The sheep-killing floor is lighted almost entirely by artificial light.

Killing was not in progress at the time of our visit to abattoir No. 15, but it was observed that the head inspection of hogs was accomplished by artificial (incandescent) lights. A skylight above the gutting bench furnishes good light for visceral inspection, but an incandescent light is provided in case the necessity for its use arises. The final inspection of hog carcasses is made in a well-lighted place on the hanging floor near windows. Two trucks marked "U. S. Condemned Meat," to be used for conveying condemned carcasses to the tank, were observed on this floor chained to a post. Two buckets labeled "Poison" were also chained to this post. These buckets, during the time of killing, contain a 1-1,000 solution of corrosive sublimate for the purpose of disinfecting the hands and knives of the inspectors after coming in contact with diseased tissues. The killing floor of the beef house of this plant is provided with good natural light on three sides and from the skylight above. No killing was in progress at the time of visit.

The hog-killing room of abattoir No. 206 is crowded with machinery, and both the head and visceral inspectors perform their duties by the aid of artificial light. The bench occupied by the visceral inspector is rather high for the most efficient service, and it is recommended that 10 inches be cut from the four legs of this bench in order that the inspector may be nearer the trough which conveys the viscera toward him. The final inspections are made on the hanging floor where an ample amount of natural light is provided. Sheep were being slaughtered at the time of visit, in a room provided with natural light on two sides and from two skylights.

The hog-killing room of abattoir No. 35, where the head inspection is conducted, is well lighted naturally by a skylight. A washer cuts off the light at the point where the visceral inspection is made, making it necessary to use artificial light continuously. The final inspections are conducted on the hanging floor, near the windows.

The cattle-killing room of abattoir No. 11 is supplied with good light, and ventilated from windows on three sides and the skylight overhead. Killing was in progress. The hog-killing floor of this plant is provided with natural light for head and visceral inspection. The final inspection of tagged hogs is conducted in a passageway which is flooded with natural light and affords excellent facilities for the work. Fair natural light and good artificial light are provided on the sheep-killing floor of this house.

Killing had ceased before our arrival at the beef house of abattoir No. 2. The light on the killing floor was fair, but it was stated that the numerous arc lights suspended from the ceiling are used when killing is in operation. The killing floor for sheep and shipper hogs in this house has good natural light. The light was very good on the killing floor of the hog house of this abattoir, being especially fine at the point where the head inspection is conducted. The visceral inspection is likewise accomplished by natural light on clear days, but a cluster of incandescent lights is provided in case it becomes necessary to use artificial light. The final inspection of hogs is made in the hanging room by ample artificial light.

At the hog house of abattoir No. 3 the head inspector is located, so that he can readily palpate the glands of the neck in the suspended carcass after it leaves the scraping bench. His position, is under an artificial light, which was sufficiently bright to enable him to attend to the work. This was also true of the inspector at the gutter's bench. Both these inspectors are placed in a very undesirable location, so far as their personal comfort is concerned. The final inspection of hogs is conducted in the cooling room, near a row of windows, which provides an abundance of natural light. The east house of this abattoir, where cattle are slaughtered, is provided with

good natural light, but the north house is not so well lighted, requiring the use of electric lights.

At abattoir No. 36 the inspection of heads and viscera is made by artificial light, while the final inspection is performed by natural light.

The natural light on the killing floor of abattoir No. 24 was not good, nor was the supply of artificial light at the gutting bench sufficient for proper inspection of the viscera. It was stated that this subject has been under consideration, and steps had been taken to increase the number of incandescent lights at this point. The final inspections are conducted in an alley outside the killing room under good natural light.

The beef beds at abattoir No. 95 are well lighted, providing an excellent opportunity for proper inspection.

The same is true at abattoirs Nos. 147, 96, 64-A, 94, and 169.

The principal conditions requiring condemnation on post-mortem examination are mentioned in order No. 125 of the Bureau of Animal Industry, Department of Agriculture, and include hog cholera, swine plague, anthrax, rabies, malignant epizootic catarrh, septicemia, and pyemia, advanced form of scabies, actinomycosis, inflammation of the lungs, pleura, intestines, peritoneum of the uterus, Texas fever, tuberculosis, hemorrhagic septicemia, blackleg, advanced pregnancy, or recent parturition; any disease or injury causing an elevation of temperature or otherwise rendering the flesh unwholesome; unborn, stillborn, or immature animals; anemic or emaciated animals; those organs or portions of carcasses which are badly bruised or affected with tuberculosis, actinomycosis, cancer, or other malignant tumors and abscesses, suppurating sores, tapeworm cysts, and liver flukes; caseous lymphadenitis, parasitic ictero-hematuria, urticaria, icterus, and uremia. When carcasses showing any of these conditions are to be destroyed they are placed, together with a certain amount of floor scrapings, intestinal contents, and other filthy substances, in the fertilizer tank, under the supervision of an inspector, who attends to the sealing of the tank, as hereinafter described.

If only isolated muscles or portions of the carcass are to be destroyed, as a result of unhealthful or repulsive appearance, the carcass is usually removed to the cooling room, with the condemnation tag on it, and when properly chilled the affected parts are detached and tanked, while the condemnation tag on the remainder of the carcass is removed and the regular inspection label placed upon the passed portions. The condemnation of meat for human food does not necessarily imply that the animal producing the meat was diseased. Such condemnation may have been due to such causes as fatigue, asphyxiation, immaturity, or other repugnant conditions. These may not prevent the consumption of the meat with impunity, but the suggestion of them is loathsome to the American people, who desire to eat only palatable meat of known quality. Flesh showing any unusual condition is always a source of apprehension to the American public, who do not care to eat meat, even if wholesome, should it present an offensive appearance. The Bureau regulations, which were devised to control the disposition of meat from inspected carcasses, are clearly defined, thorough, and most rigid; and backed by them the inspector may unflinchingly perform the duties of his office. They are based on the work of the highest recognized authorities upon the various diseases in question, and were promulgated only after due consideration was given to the results and opinions of these scientists, in Europe as well as in this country.

To discriminate with certainty between good and bad in the matter of meat supply is to the experienced inspector not a difficult task when the carcass represented is an extreme, but for those cases on the border line a satisfactory and accurate conclusion is not so easy as at first sight appears, for it is extremely difficult at times to say what should be accepted and what rejected.

To the inspector in Germany, Italy, Belgium, and France it is not merely a question of "yes" or "no," but with their Freibank (a place where sterilized diseased meat and inferior meats are sold as such) and the permission to sell certain infected meat after cooking, or raw meat of a low nutritive value, the responsibility is divided and materially lessened. It is quite erroneous to imagine that because of several possible actions of the German inspector the carcass passed as fit for food is in all cases from a normal animal. Perusal of the official regulations concerning the method of procedure with the meat of tuberculous animals in the Kingdoms of Prussia, Bavaria, Saxony, the Grand Duchy of Hesse, and Mecklenburg-Schwerin will show that the carcasses of animals containing lesions of tuberculosis, not generalized or extensive, are freely admitted to the market without restriction, just as if no tubercular alteration had existed. This is further brought out by the result of this provision in the Kingdom of Saxony in the utilization of the meat of tuberculous animals. In 1895, 1.93 per cent of tuberculous cattle was destroyed, 5.51 per cent was sold on the Freibank, and 92.54 per cent freely admitted to the market, while 1.42 per cent of tuberculous hogs was destroyed, 24.25 per cent sold on the Freibank, and 74.3 per cent freely admitted to the market. In 1899, 1.41 per cent of tuberculous cattle was destroyed, 5.15 per cent sold on the Frei-

bank, and 98.43 per cent freely admitted to the market, while 0.83 per cent of the tuberculous hogs was destroyed, 26.36 per cent sold on the Freibank, and 73.01 per cent freely admitted to the market. In the Kingdom of Bavaria, in 1903, 825,954 swine were slaughtered, of which 1.1 per cent were found tubercular. These tubercular carcasses were disposed of as follows: Eighty-one and four-tenths per cent were passed for sale without restriction, 17.9 per cent sold on the Freibank, and 0.7 per cent destroyed. Surely this does not indicate that all diseased animals in Germany are either sold as such or condemned, and that all meat freely admitted to the market is from normal animals.

What is said here of the treatment of tubercular carcasses may be applied also to meat showing other diseased conditions. For instance, in actinomycosis where isolated foci occur in the tongue, it is recommended by certain German authorities to remove the diseased parts and release the remainder of the tongue for food, while according to the Department regulations the entire head would be tanked for offal. In fact, the latter regulations are much more stringent than those of the Germans, and meat which is made into fertilizer in conformity with them may be passed for food without restrictions in Germany.

The Department regulations stipulate that diseased carcasses shall be either condemned for offal or passed for food, excepting in those cases of hogs showing mild lesions of hog cholera or tuberculosis, when they may be rendered into lard, provided they are cooked by steam for four hours at 220° F., the tubercular lesions having first been removed and condemned. Not the slightest objection can be raised against this procedure from a hygienic standpoint, and in justification of this action may be mentioned the resolutions adopted by the *Congres pour l'etude de la Tuberculose chez l'Homme et chez les Animaux*, of 1893 and 1898, and the works of Ostertag, the highest authority on meat inspection in Europe, Edelmann, Johne, Stubbe, Bollinger, and many other prominent investigators, whose opinions on this subject are decidedly more liberal than the above regulations of the Department of Agriculture.

It has been acknowledged in all countries having a rigid system of meat inspection that some provision should be made for fat and half-fat carcasses showing lesions which are too slight to cause condemnation for offal, and yet are of such a character that one would not care to pass the carcasses for food. It is these cases that the regulation permitting them to be rendered into lard operates most usefully, and saves for both the producer and consumer that which would be entirely lost without it, and at the same time conforms fully to all the requirements of hygienic science.

Under the provisions of the Federal regulations each abattoir at which inspection is established shall provide a suitable room in which condemned carcasses and parts shall be held until such time as the inspector or his assistant may be present to supervise the tanking thereof. Such room shall be arranged for locking with a padlock, which is furnished by the Department, the key to same to remain in the possession of the inspector or his assistant. If, however, the abattoir management fail to provide a suitable retaining room of sufficient size, or fail to tank condemned carcasses regularly on the day of their condemnation, such condemned carcasses shall be thoroughly slashed with a knife, then saturated with kerosene and locked on the hanging rail, pending their final disposition for offal.

The retaining room at abattoir No. 1 is located at one end of the beef cooler at right angles to the outside wall, the wall forming one side of the room, while the other three sides are constructed of narrow boards, extending from the floor to the ceiling, and placed some 2 or 3 inches apart. From the location of this room the air does not necessarily come in contact with the condemned carcasses contained therein before it reaches the beef in the other portion of the cooler. One of the retaining rooms at abattoir No. 2 is located along one side of the beef cooler and separated from the latter by a solid partition, being entirely isolated. The other room in the cooler for sheep and swine also has a solid partition on all sides, and is equally well isolated from the meat products which are intended for human food. In both the "east" and "north" houses of abattoir No. 3 the retaining rooms are located along one side of the coolers, and are formed by the wall of the coolers and slat inclosures. The compartment set aside for the reception of condemned carcasses and parts at abattoir No. 11 is located in the coolers, and is constructed in a manner similar to those above indicated. The retaining room at abattoir No. 35 is situated along the wall of one of the big coolers. This room has not been recently used, as condemned carcasses and parts are tanked daily from the hanging floor. The location of the retaining room at abattoir No. 95 is in a corner of the cooler, three sides of the room being constructed of boards placed some 2 or 3 inches apart to permit of circulation of cold air among the carcasses which may be contained therein. A room similarly located and constructed is provided at abattoir No. 96. The retaining room for swine in abattoir No. 206 is located along one side of the hog cooler, and was observed to be filled with hog carcasses which had been condemned.

At this abattoir there is also a retaining room in the beef cooler for the accommodation of beef carcasses which may be condemned upon post-mortem examination. These rooms were located and constructed in the usual manner to provide for circulation of cold air. No carcasses having putrefactive changes of any kind or giving off offensive or unnatural odors are placed in the retaining rooms, but are immediately tanked. Some of the establishments are not provided with retaining rooms, and these are not considered necessary on account of the character of their business, as some firms do no slaughtering, while others tank the condemned carcasses on the day the animals are slaughtered, and a retaining room is therefore not required under Department regulations. The final disposition of all carcasses and parts which are condemned on post-mortem inspection is either tanking them for grease or offal or tanking them for lard. In the latter instance hog carcasses which are found to contain slight lesions may be tanked for lard as before described, and cooked by steam for four hours at a temperature not lower than 220° F.

The number of tanking vats at abattoir No. 1 is 18, placed in two rows, one at right angles with the other. One row contains 12 tanks which are used for lard, while the other row is composed of 6 tanks, 3 of which are used for fertilizer and 3 for grease. These tanks are well isolated, being below the killing floor. Condemned meats are placed in a chute on the killing floor, and these chutes convey the meats to the tanks below. In the hog house at abattoir No. 2, one tank room, which is completely isolated, contains 22 rendering tanks, arranged in pairs in a row. Eleven of these tanks are used for fertilizer, while the others are for lard. In an adjoining room there are 32 other tanks, in two groups. All of these tanks are used for lard, and are in an entirely separate room. In the beef house of this abattoir the tank room is isolated and contains 12 rendering tanks, which are used for beef products. The tank rooms of this abattoir are unusually well lighted and ventilated. In the hog house of abattoir No. 3 there are two offal tanks, which are located in the extreme corner of the room where sausage casings are cleaned and prepared. These tanks adjoin two other tanks, which are used for rendering grease and are located in rather close proximity to products which are being prepared for food. In that portion of this abattoir known as the "north" house there are three tanks used exclusively for offal, and located in an entirely separate room. The tanking of condemned carcasses, therefore, at this house is done on the killing floor in a room partitioned off from the floor and well removed from the meat products. In that portion of abattoir No. 3 known as the "east" house the rendering tanks are similarly isolated, being situated in a separate room removed from killing floors, or rooms where meat products are handled or stored. The tank room of abattoir No. 11 is isolated and located immediately below the hog-killing floor and is provided with four rows of tanks, one on either side and two in the center. Six of the tanks on one side are used for cattle offal. Of the 8 tanks on the opposite side, 2 are used for fertilizer. The two central rows consist of 16 tanks, and are used for making tallow and lard. On the hog-killing floor of abattoir No. 15 are located the rendering tanks, which are in two parallel rows. Four of these tanks are used exclusively for fertilizer and are not as far removed from the rail over which hog carcasses pass as is desirable. The upper openings of the rendering tanks at abattoir No. 24 are situated on the floor where the hogs are killed and dressed. There are 12 of these tanks in a row, the usual distance apart, 2 of them being used for offal and the others for rendering lard. The walls and ceilings of this room were fairly cleanly, although the fertilizer tanks are in closer proximity to the rail over which dressed carcasses pass than is desirable. Abattoir No. 35 is provided with 17 rendering tanks, all of which have their upper openings on the killing floor. They are situated in a row along the wall, and 2 of them are reserved for the exclusive use of products which are eventually used for grease and fertilizer; these latter tanks being closer to the rail on which dressed carcasses pass than should exist, without being in a separate room. Directly over these tanks in the ceiling are three large openings about 3 by 20 feet in size, which connect by shafts with the outside air. The rendering tanks of abattoir No. 36 are located on the killing floor. There are 8 of these tanks in a row, and 1 of them is used for offal. The offal, or fertilizer, tank is at the end of the row and close to the hanging rail over which dressed carcasses must pass to the coolers. The tank room at abattoir No. 64A is provided with 4 rendering tanks, 1 of which is set aside for offal. This room is separated by a brick wall from the other compartments of the establishment, and has been recently whitewashed, and is well lighted and ventilated. The tanking at abattoir No. 94 is done in 1 rendering tank situated in a separate room, the ceiling of which is very low and the windows covered with dirt and dust. The tanks at abattoir No. 95 are located in a compartment adjoining the sheep-killing beds. Three of the tanks are set aside for the material of the establishment which is rendered into fertilizer and grease. Two rendering tanks are provided at abattoir No. 96, the upper openings of which are on the floor a half story above the adjoining cattle beds where the animals are slaughtered and some of the food products are prepared. At abattoir No. 147 provision is made for tanking condemned carcasses in a room well isolated from meat products and separated from the

other portions of the establishment by brick partitions. Of the 3 rendering tanks 1 is used for offal and the other 2 for lard. At abattoir No. 189 there is a chain of 5 tanks located on the trimming floor. One of these tanks is used for condemned parts and offal, and is at the end of the row nearest the rail over which dressed hog carcasses pass. The space intervening between said tank and the rail is less than should exist without a permanent partition or proper means of ventilation. At abattoir No. 198, in the center of the killing floor, where carcasses are slaughtered and dressed, and between the beef and sheep beds, there are two rendering tanks, one for offal and the other for tallow. In this room there is good natural light and ample ventilation. The tank room at abattoir No. 208 is situated on the floor below where hogs are slaughtered. This room contains 10 tanks on one side, while on the other side 6 tanks are located. The upper openings of these tanks are located on a level with the floor. In the first row there are 9 lard tanks, and 1 for offal and grease. Four lard tanks and 2 offal tanks make up the other chain.

There are a number of the official establishments which are not provided with rendering tanks, and owing to the character of their business such tanks are not necessary. Some of the establishments conduct only a packing business.

When a carcass is condemned, the official condemnation tag is attached thereto and sealed with the United States condemnation seal. When such carcasses are not immediately tanked, they are placed in a retaining room and there locked with a Government lock, the key to which is kept in the possession of a Federal employee to await tanking for fertilizer and grease. The committee has observed the tanking of condemned carcasses, which was being done in the presence of an inspector under the regulations which provide that after the lower opening of the tank has been sealed by an employee of the Bureau, the condemned carcasses and parts are removed from the retaining room and placed in the rendering tank. If such tanking is done in the morning a sufficient force of steam is immediately turned into the tank to destroy effectually the meat for food purposes before the killing for the day is completed. When tanking is done at the close of the day or when killing is suspended, both ends of the tank are sealed with wire and lead seals, provided by the Department, after which the steam is turned into the tank until the meat is destroyed. Hog carcasses in which slight lesions of certain diseases are present are permitted to be rendered into lard, as above stated. All the affected viscera of such carcasses are placed in the offal tank. When condemned carcasses are tanked immediately from the hanging floor, they are cut down into trucks and carried to the offal tanks. No condemned meats were observed being dragged along the floors of any establishment.

It has been alleged that the carcasses of animals which have died in the stock yards or on the trains en route to Chicago, and the meat of some of the condemned carcasses, are loaded in box cars and hauled to a place at Globe, Ind., where they make a fancy grade of lard. In order to determine the correctness of the statement, Dr. S. E. Bennett was requested to visit the plant above referred to and to report fully concerning the carcasses handled by this establishment, and especially regarding the various products which are prepared therein. His report on this investigation is as follows:

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY, LOCAL OFFICE,
Chicago, Ill., March 31, 1906.

CHIEF OF BUREAU, Washington, D. C.

SIR: Referring to your letter of the 29th instant, also telegram of same date, concerning rendering works at Globe, Ind., you are advised that I have visited the plant and find that it is known as the National Rendering Company with office in Exchange Building, Union Stock Yards, Chicago, Ill. Mr. Edward Meyer is the manager.

The building is a two-story frame structure with no cellar and is much the same as all rendering establishments. Evidently considerable care is exercised by the management to keep the place as clean as possible. The plant is equipped with boilers, an engine; 13 tanks, 12 feet by 6 feet; presses; vats, in which oils, tallow, and grease are drawn off; also roller for drying tankage. No commercial fertilizer is made at this plant, but the dried tankage is sold to other factories.

The various products of this plant are white grease, B white grease, brown grease, tallow, and horse oil. These various products are made from the cattle, sheep, and hogs that die in the Union Stock Yards, also those that die in cars en route to market.

In warm weather these carcasses are delivered to the plant in the afternoon of the day on which they arrive and in cold weather the morning after. A great many dead horses and dogs from the city are also sent to this plant. During the year 1905 the following dead animals were handled:

Hogs	25,486
Cattle	1,214
Sheep	4,504
Horses	9,067

There are no facilities in this plant for the manufacture of oleo oil or lard. All the tierces in stock in the storage house were labeled white grease, tallow, etc. The tierces are all old ones and evidently not well cleaned. No shop tallow or fat are received here.

The Larkin Soap Company, Buffalo, N. Y., takes 75 per cent of the output during the summer. Pfau & Sons, Jeffersonville, Ind., and the Globe Soap Company, Cincinnati, Ohio, also purchase soap material here. A good many sales are also made through brokers.

There is nothing about the place to indicate that it is other than what it is supposed to be.

Very respectfully,

S. E. BENNETT, *Inspector in Charge.*

P. S.—Tanks are cooked at a pressure of 40 pounds.

THE MEAT-INSPECTION SERVICE MAINTAINED AT CHICAGO BY THE STATE OF ILLINOIS.

As previously indicated, all cattle in the yards suspected of being affected with the disease known as actinomycosis, or lumpy jaw, are tagged by representatives of the State of Illinois, who confine their work to this particular disease. The slaughtering of these animals is supervised by city, State, and Federal inspectors at an official establishment, and under an arrangement between the State live-stock board and the local live-stock exchange the latter disposes of the beef and products of such cattle for the benefit of the owner in accordance with the following rules:

RULE XXIV.—*Adopted by the Chicago Live Stock Exchange to take effect July 23, 1894.*

SECTION 1. No member or members of this exchange shall buy, sell, or dispose of, or weigh to any purchaser thereof, or cause to be bought, sold, or disposed of, or weighed to any purchaser thereof, any animal apparently affected with actinomycosis, commonly called "lumpy jaw," or having any lump or swelling upon the head or neck, until the said animal has been inspected by the State veterinarian, or an assistant State veterinarian, and such inspection shall be made prior to the time when such animal is weighed, or if not weighed, then before it is delivered. Only such animals as the veterinarian shall pronounce free from the said disease shall be accepted and paid for by any members who may have purchased the same.

SEC. 2. Members of this exchange having possession or control of any animal or animals apparently affected with the said disease or having any lump or swelling upon the head or neck, shall call upon the State veterinarian at his office for inspection of such animal or animals, and if upon inspection such animal is found to be free from disease deemed doubtful by him, such animal shall not be bought, sold, or otherwise disposed of by animal in the regular course of business, and said animal shall be accepted by any member purchasing or who may have purchased the same. If such animal shall not be so passed, or found free from disease, but either shall be condemned by said veterinarian, or assistant State veterinarian, or shall upon such inspection, alive or upon foot, be deemed doubtful by him, such animal shall not be bought, sold, or otherwise disposed of by any member of this exchange on foot or alive, nor shall the carcass of any such animal nor any part thereof be bought, sold, or in any way disposed of by any member of this exchange, unless and until there has been a post-mortem examination thereof by said veterinarian and the said carcass has been by said veterinarian after such examination deemed and declared to be healthy and fit for food.

SEC. 3. Any member convicted of a violation of this rule shall be fined \$50 for each animal so bought, sold, or disposed of before inspection by him or his agents.

SEC. 4. The board of directors are authorized to provide, arrange, and agree that this exchange shall pay or provide the salary, not to exceed \$— per month, of such person, to be selected by said board of directors, as the State board of live stock commissioners shall accept, to have charge of all animals affected with said disease, or apparently affected therewith, and of the quarantine thereof, pursuant to the statutes of Illinois in such case made and provided; provided such person shall make a daily report of the business of his station and perform such other duties in the premises as may from time to time be required of him by said board of directors not inconsistent with the statutes aforesaid.

SEC. 5. The secretary of this exchange shall keep a set of books showing the number and disposition of every animal inspected as aforesaid and shall provide and account for two sets of metal tags duly numbered and stamped, to wit: Of square tags stamped "Condemned," for condemned cattle, and of round tags stamped "Passed," for passed cattle, with a device for fastening the same in the ears of all inspected animals, and, also, a like number of blank paper receipts bearing the same number as the tags, both of which he shall issue as may be required to the duly appointed veterinarian.

SEC. 7. A private telephone system, connecting all cattle scale houses, the quarantine pen, and the secretary's office, shall be established by this exchange.

SEC. 8. It shall be the duty of one member of the board of directors of this exchange (who shall perform this duty in rotation) to be present at all times when any infected or diseased animal is slaughtered, to report to the secretary the results of such killing, and personally to see that all portions of condemned animals, except the hide goes into the tank and is rendered unfit for food, and that all the provisions of this system are rigidly adhered to.

SEC. 9. The board of directors is hereby charged to take all necessary steps to make the provisions and intent of this rule effective, and the directors may appoint a committee of three members of this exchange for that purpose.

RULES PROVIDING FOR THE INSPECTION AND SLAUGHTER AT THE UNION STOCK YARDS, CHICAGO, OF ANIMALS AFFECTED WITH ACTINOMYCOSIS.

RULE 1. The board shall appoint as State agent at the Union Stock Yards, Chicago, an assistant veterinarian, who shall act under the direction of the board or any member thereof. The board shall appoint such assistant agents as it shall deem proper, who shall hold themselves subject to the orders of the agent above provided for.

RULE 2. The board shall establish an office in the exchange building at the Union Stock Yards.

RULE 3. There shall be established by the Chicago Live Stock Exchange, in the Union Stock Yards, a quarantine pen conveniently situated, to be known as the "State quarantine pen," in which shall be placed all animals failing to pass ante-mortem inspection.

RULE 4. Any person, firm, or corporation doing business at the yards who shall have any animal or animals apparently affected with actinomycosis, commonly called "lumpy jaw," shall immediately notify the secretary of the live stock exchange or the State veterinarian or assistant State veterinarian.

RULE 5. Upon receiving any notice, as provided for in rule 4, it shall be the duty of the State veterinarian or assistant State veterinarian to inspect such animal or animals as soon as possible.

RULE 6. The State agent shall place in the ear of each animal examined a tag, indicating whether it has passed or has been held for post-mortem examination. A round tag for "passed" and a square tag for "condemned."

RULE 7. The State veterinarian or assistant veterinarian shall keep a record of all animals inspected, which record shall show: (1) Date of inspection; (2) for whom the animal is inspected; (3) the description of the animal; (4) tag number of animal; (5) weight of animal; (6) the result of the inspection; and he shall furnish to the secretary of the live stock exchange each day, at the close of business, a copy of such record signed by him, and he shall also file at the end of each month with the secretary of this board a copy of the record for that month.

RULE 8. It shall be the duty of the State agent and his assistants to place in the "State quarantine pen" each day all animals held for post-mortem examination.

RULE 9. When any animal is held for post-mortem examination, and the owner thereof or his agent refuses to accept for such animal the amount fixed by any contract made for the slaughter of condemned cattle by the live stock exchange, then such animal shall be held in quarantine until the same shall be duly appraised, as provided for in section 48 of Revised Statutes, chapter 8, "An act to revise the law in relation to the suppression and prevention of the spread of contagious and infectious diseases among domestic animals," approved June 27, 1885, in force July 1, 1885, as amended by the act approved June 15, 1887, in force July 1, 1887. This appraisal shall take into consideration the price obtainable for such animal if condemned and to be converted into material not used for human food. If such an appraised animal is passed by the duly authorized veterinarian after slaughter as fit for human food, then this appraisal shall be void and the carcass revert to the owner, who shall pay for the cost of slaughter.

RULE 10. All animals held for post-mortem examination shall be slaughtered as often as this board shall deem proper and necessary at a special slaughterhouse to be provided for that purpose by the Chicago Live Stock Exchange. The slaughter of said animals and the disposal of their carcasses shall be held under the supervision of the committee of three, consisting of the State veterinarian and one of his assistants, to be designated by this board, an officer appointed by the board of health of the city of Chicago, and a member of the board of directors of the Chicago Live Stock Exchange. Such condemned carcasses shall be immediately tanked and rendered unfit for food under the personal supervision of the committee above provided for. Said committee shall report to the State veterinarian or assistant veterinarian and also to the secretary of the live stock exchange the result of the killing. All carcasses found after slaughter to be healthy shall be held subject to the order of the owner or his agent.

RULE 11. Nothing in the above rules shall be construed as abrogating the right of the State board of live stock commissioners or its agents to make such inspection of the yards as they may desire for the purpose of ascertaining whether all cattle affected with actinomycosis are duly reported to the veterinarian and subsequently rendered unfit for food.

THE MEAT-INSPECTION SERVICE MAINTAINED AT CHICAGO BY THE CITY OF CHICAGO.

The meat-inspection force of the city of Chicago is composed of six men, two of whom are veterinarians, one a physician, all being under the supervision of J. F. Biehn, M. D., director of the laboratory, who is an assistant to Charles J. Whalen, M. D., commissioner of the department of health.

The duties of two of these city inspectors are to look after retail meat stores, markets, and commission houses in the "Loop" district, while the remaining four, including the two veterinarians, are stationed at the Union Stock Yards and vicinity to inspect meats in the slaughter and canning establishments of that district.

On the Friday, March 9, before the committee reached Chicago a number of lumpy-jaw cattle, which had been rejected at the Union Stock Yards on ante-mortem examination, were slaughtered at abattoir No. 95, and eleven of the carcasses passed by the Government inspector were condemned by the two representatives of the city, one a layman in charge and the other a veterinarian, who took no part in the post-mortem examinations and resulting condemnations. These eleven carcasses, together with the heads, livers, lungs, and hearts, had been retained, and on March 15 the committee visited the abattoir in which they were held and made a careful examination of all the lesions. The dressed carcasses, together with the heads and viscera, were properly tagged, thereby affording a means for identification. The heads had not been tongued, and in only three instances were the local lesions incised, but the lungs, livers, and hearts had been sectioned. The following are the post-mortem notes made on these carcasses:

*Post-mortem notes on eleven carcasses of beef passed by Federal inspectors and condemned by the city board of health on Friday, March 9, 1906. Reexamination conducted by Drs. J. R. Mohler, R. P. Steddom, S. E. Bennett, and U. G. Houck.**

Carcass No. 1.—External actinomycotic tumor in the right submaxillary region, about the size of one's fist, and well encapsulated. The right postpharyngeal gland is the size of a walnut, and necrotic. Two areas of necrosis in the substance of the liver, about the size of peas, which were greenish in color and due to *Bacillus necrophorus*. This was a stag carcass in only fair condition, but without lesions apparent in the carcass proper.

Carcass No. 2.—Superficial actinomycotic tumor at the angle of the right lower maxilla, about the size of an apple, with three centers of pus, inclosed by thick fibrous tissue. Several areas of necrosis are apparent in the substance of the liver, evidently caused by *Bacillus necrophorus*. This was a steer carcass above the average in condition, and did not show any other lesions.

Carcass No. 3.—The cheesy actinomycotic abscesses were observed located below the left ear and behind the lower jawbone, the size of lemons. The contents were semifluid in consistency, and circumscribed by a dense fibrous tissue. The carcass was that of a steer, and presented no other lesions. It was above the average in condition.

Carcass No. 4.—At the base of the tongue in the submaxillary region is quite a large liquid abscess the size of a teacup, circumscribed by a thick capsule. Indications of mixed infection are apparent. One tubercular nodule the size of a hazelnut and slightly calcified was noted in the right ventral lobe of the lung. This carcass was that of a steer in fine condition, and presented no further lesions.

Carcass No. 5.—On the right lower maxilla and on the left side of the tongue two fibrous tumors, each about 2½ inches in diameter, were observed, inclosing a semifluid actinomycotic pus. Both postpharyngeal glands were slightly enlarged, watery, and contained small petechial hemorrhages. This steer carcass was above the average in condition, and showed no other lesions.

Carcass No. 6.—In the right lower maxillary region there was located a large fibrous actinomycotic tumor the size of a cocoanut, which contained four or five centers of pus, well encapsulated. The carcass was that of a cow in fair condition, and presented no other alterations.

Carcass No. 7.—The entire postpharyngeal space was occupied by a large fibrous actinomycotic tumor the size of a child's head. The encapsulating fibrous tissue showed numerous hemorrhagic areas. All the adjoining glands of this region were enlarged and hemorrhagic. This was the carcass of a bull, which was in extra fine condition for bologna. No other lesions were observed in the carcass proper.

Carcass No. 8.—The right pharyngeal region contained a small fibrous tumor about 2 inches in diameter, inclosing six or eight small areas of necrosis, well encapsulated. The adjoining lymph glands appeared normal throughout, with the exception of the left retropharyngeal gland, which contained two small cheesy centers. The carcass was that of a heifer in prime condition, and presented no further lesions.

Carcass No. 9.—Two apple-sized actinomycotic tumors were located in the postpharyngeal and submaxillary regions. Both were encapsulated and contained a greenish pus, semifluid in consistency. The carcass was that of a prime steer, and failed to reveal any further lesions.

Carcass No. 10.—The entire pharyngeal region was occupied by a large caseocalcareous swelling, tubercular in character, involving both submaxillary and postpharyngeal lymph glands. The portal lymph gland contained two pea-sized nodes, while the postmediastinal lymph gland showed twice this number of similar necrotic areas. The right principal lobe of the lung presented two foci of tuberculosis of a caseous character, about the size of hemp seeds. This was the carcass of a young heifer in rather thin condition, but without any other lesions apparent.

Carcass No. 11.—Right pharyngeal region contained a tumor the size of a duck egg, composed of dense fibrous tissue, inclosing greenish semifluid pus, indicative of mixed infection. Both postpharyngeal lymph glands are enlarged, and contain numerous hemorrhagic points. This steer carcass was above the average in condition, and presented no other abnormal conditions.

In none of the above cases was the tongue involved, nor were sinuses observed communicating with the respiratory or alimentary tracts.

As a result of this examination of the above eleven carcasses, it was the opinion of the veterinarians present that no cause existed for the condemnation of the carcasses Nos. 1 to 9, inclusive, and No. 11. It was the further opinion of these officials that carcass No. 10 was on the border line, but that it would be advisable in this case to condemn the meat.

As there appeared to be a great difference of opinion between the city and Federal inspectors regarding the character and extent of lesions which should constitute a sufficient reason for condemning a carcass, the inspector in charge at Chicago, at the request of the committee, addressed the following letter to the commissioner of the department of health of the city of Chicago:

CHICAGO, ILL., March 16, 1906.

DR. C. J. WHALEN,
Commissioner, Department of Health, Chicago, Ill.

SIR: Will you kindly furnish me by bearer copy of your regulations or instructions governing the operations of your meat-inspection division? In case you have no printed regulations, would you kindly furnish this office at your earliest convenience with information as to what lesions in tuberculosis, actinomycosis, and other diseases are considered sufficient to condemn carcasses as unfit for food?

Very respectfully,

S. E. BENNETT,
Inspector in Charge.

* The committee wishes to take this opportunity for acknowledging its indebtedness to Dr. S. E. Bennett and Dr. U. G. Houck, both of the Bureau of Animal Industry, for the valuable assistance furnished by them in all phases of the investigation.

No written reply was received to this letter, but the committee was verbally informed that the instructions furnished the city inspectors would be written out by Dr. J. F. Blehn, director of the laboratory, and forwarded to Doctor Bennett.

On March 16, 1906, a member of the committee, on behalf of the committee, addressed the following letter to the mayor of the city of Chicago:

GREAT NORTHERN HOTEL,
Chicago, Ill., March 15, 1906.

Hon. EDWARD F. DUNNE,
Mayor of the City of Chicago, City Hall.

DEAR SIR: A committee of the United States Department of Agriculture, composed of Dr. John R. Mohler, Dr. Rice P. Steddom, and the writer, has been in Chicago for the past few days considering the general subject of Federal meat inspection at this point, and, incidentally, the relation of the Federal inspection to the inspection maintained by the health department of the city of Chicago. The committee is of opinion that it is advisable to confer with you, and, if you so desire, with the commissioner of public health of the city of Chicago, concerning certain aspects of this matter, and asks, accordingly, that you will name a time for the committee to wait upon you.

With the hope that you may be able to fix a time for this interview in the immediate future, and with expressions of the greatest respect, I am,
Very truly, yours,

GEO. P. MCCABE, *Solicitor.*

The mayor appointed Monday, the 10th, at 2 p. m., for the interview, which was held at that time in the mayor's office in the city hall. It was represented to the mayor by the committee that it was the policy of the Department of Agriculture to cause the meat-inspection service of the Bureau of Animal Industry to be conducted in close harmony with city and State officers in all parts of the country. The mayor was informed of the action of the city inspectors in condemning carcasses which had been passed by the Federal inspectors, and in publishing this fact broadcast through the Weekly Health Bulletin and the newspapers of the country. It was pointed out to him that if the Federal inspection was to be discredited in this way by the city of Chicago, foreign governments would be apt to view Government inspected meat with suspicion and possibly to exclude our meats. It was further stated that it was thought that the regulations of the Bureau of Animal Industry governing the condemnation of carcasses as unfit or unwholesome for food were based upon the best obtainable authority on the subject, and that the enforcement and execution of these regulations was in competent, honest hands; that if the city could point out defects in the regulations or in the manner of enforcing them, then the Department would be pleased to remedy the defects at once. But if, on the contrary, after an examination of the regulations and the methods of inspection, no defects could be pointed out, then the committee considered it advisable for the city to adopt the regulations of the Bureau of Animal Industry governing the inspection of meat and to work in close harmony with the Federal inspectors.

Mayor Dunne immediately agreed that this was a fair and proper course, and called in Dr. C. J. Whalen, commissioner, department of health, and instructed him to investigate the matter with the committee. Doctor Whalen stated that this matter was almost entirely in the hands of Dr. J. F. Blehn, director of the laboratory, who is a subordinate of Doctor Whalen.

Doctor Blehn was sent for. When the matter was explained to him he agreed to go over the regulations and point out where they differed from his instructions to the inspectors of the city of Chicago.

An appointment was made for the committee to meet Doctor Blehn on Tuesday, March 20, but owing to a meeting of the judiciary committee of the city council, which had not been anticipated, Doctor Blehn was unable to keep this appointment. The committee eventually met with him at his office, 215 Madison street, on Wednesday, March 21, at 3 p. m.

Doctor Blehn stated that after a careful examination of the rules and regulations of the Bureau of Animal Industry governing the inspection and condemnation of meats he found that they agreed with his ideas and with the views of the best authorities as expressed on the subject.

A full discussion of the lesions of the eleven carcasses above described was also had, and the decision of the committee regarding the disposition of the carcasses showing such lesions was fully concurred in by Doctor Blehn.

A memorandum was then prepared, reading as follows:

CHICAGO, March 21, 1906.

At a meeting held in the office of Dr. J. F. Blehn, director of laboratories, department of health of the city of Chicago, at which there were present, representing the city, Doctor Blehn, and representing the United States Department of Agriculture, Dr. J. R. Mohler, Chief of the Pathological Division of said Department; Dr. R. P. Steddom, Chief of the Inspection Division of said Department, and George P. McCabe, esq., solicitor of said Department, it was agreed that there was a substantial unanimity of opinion between the Department of Agriculture and the city health department on the subject of the regulations governing the passing and condemnation of meats.

It was further agreed that the two departments should endeavor to cooperate in every way and to work in close harmony, and that hereafter the Bureau of Animal Industry Order No. 123, with its amendments, being the rules and regulations of the Department of Agriculture governing the inspection of meats, should be the standard for the meat inspection of the city of Chicago.

This memorandum was signed by Doctor Blehn for the city, and by the committee for the Department of Agriculture. It was approved by Dr. Charles J. Whalen, commissioner of health; by E. F. Dunne, mayor of Chicago, and by the Hon. James Wilson, Secretary of Agriculture.

THE GOVERNMENT SUPERVISION OF CANNED PRODUCTS.

At abattoir No. 1 the following legends were noted on trade labels on canned products:

Wm. H. Andrews, Chipped Beef, Chicago, Ill., Factory No. 1. The meat in this can is of superior quality, having been approved by the U. S. Government inspectors. Fairbank Canning Co., Lyon Brand Corned Beef. The meat contained in this can is of superior quality, having been carefully selected under our personal supervision and inspected according to the law enacted by Congress March 3, 1891, regulating the inspection of meat.

Lunch Tongue, Fairbank Canning Co. Factory No. 1. The meat in this can is of superior quality and has been inspected by U. S. Inspectors according to the act of Congress of March 3, 1891.

Some of the packages in abattoir No. 35 were marked to show that the meat products were prepared at abattoir No. 125. Abattoir No. 11 is using at least five official abattoir numbers upon the products prepared in this house. Most of the products bear abattoir No. 11, while others bear Nos. 8, 15, 21, or 125.

The legends are misleading and the marking of packages is not in accordance with the requirements of the regulations, which provide that each article of food product made from inspected carcasses shall bear a label containing the official number of the establishment from which said product came.

SANITARY CONDITIONS.

In making an inspection of the sanitary conditions of the various abattoirs the committee was very careful not to fall into the common error of selecting the best or the worst as typical. The sanitary condition in some abattoirs is good, in some it is fair, and in others bad. The danger of mistaking an episode for a practice is illustrated by an incident which the committee observed on March 12 in the course of inspection of abattoir No. 1. In the cooler of this plant two rats were observed consuming the meat of a condemned hog carcass. They had partaken of a considerable portion of the trichinous meat. In no other abattoir or portion thereof were any rats or rat excrement seen, although the committee visited every room and cellar of each abattoir. In many cases cats were observed, which were maintained in the abattoirs for the purpose of exterminating rats, and other means of preventing the depredations of rats were observed. The committee has felt unable to make a generalization of the sanitary conditions, and gives herewith the specific facts observed in each abattoir:

ABATTOIR NO. 1.

Hog House.—Cooler.—Contained one hog carcass marked "C," on account of the presence of live trichinae. As previously stated, two rats were eating meat from this carcass.

Killing room.—The walls and woodwork of the killing room are painted to a height of 10 feet above the floor, and presented a clean appearance. Above the paint the woodwork is whitewashed, but not recently. The timbers were wet, probably as the result of condensation of steam. There were considerable accumulations of dirt on overhead rafters and beams. The windows of this room were dirty. The natural light and ventilation were good. The visit of the committee was unannounced and unexpected, and it was observed that workmen were engaged in cleaning the floors, benches, and various portions of the machinery. The odor of chloride of lime was noticed. At the close of the day's work the killing floor was washed with equal parts of caustic soda and pine tar, followed by an application of hot, steaming water. On the floors of the cutting room and trimming room washing soda and hot, steaming water were applied. The order of the superintendent with reference to this work was reported by a workman as "No saving of soda; make it clean." After this solution is applied the floors are dried with rubber squeegees. A jet of hot water had been applied to the ferris-wheel scraper and accessories, sticking pens, and other portions of the killing floor, leaving it in a clean, sanitary condition. The windows of the trimming and cutting rooms were dirty, both inside and out. The dirt on the inside of the windows was hard, adhering closely to the glass and

soiling the hand when passed over the glass. The only place in the killing room, cutting room, or trimming room in which artificial light appeared to be necessary was a small room where sausage casings were being prepared, and in this room the light was entirely artificial. Immediately under the killing floor there is a half story to which condemned meats are taken and dropped down a chute to the tanking floor. This place was dirty and practically without light, either artificial or natural.

The water-closets for the workmen consisted of one rail-seat closet on each floor, one above the other, all opening into a common shaft terminating in a trough, through which a constant stream of water was flowing. A portion of the excrement and toilet paper is caught on a level with the floors of the upper closets. In one of these closets a jet of live steam was playing on the excrement, and the vapor was rising and being disseminated across the rail on which the hog carcasses were carried to the cooler.

In the storage cellars the windows were filthy, and cobwebs were noticed in many places. The floors in some of the low places were an inch deep in brine.

The salt pork is piled on the floor, without racks, except in the case of salt pork which, it was understood, was being prepared under a contract with the War Department. This was piled on a rack and cleared the floor by 6 inches, allowing the pork to drain and dry. In all these cellars artificial light was the rule.

Along the prominent passageways, between the piles of pork, burlap is placed over the meat about 2 feet up from the floor in order to keep the trucks, squilgees, etc., from "sparking" the meat.

BEEF HOUSE.—The *killing floor* was of brick, very even, reasonably clean, and the natural light was above the average. The posts on the killing floor are paluted red, and the walls of the building are painted with asphaltum paint. The overhead timbers are all new and unpainted. Considerable dirt was deposited on the various beams and fixtures.

The *coolers* were in very good condition.

The *retaining room* was almost filled with meat, part condemned by Federal inspectors and the other part by city inspectors.

The *pickle cellar* has a sealed ceiling. The floors were very wet, and drainage was imperfect. There was plenty of artificial light.

The *tripe and pigs' feet room* has good light and good floor; no paint or whitewash, and the product appears to be carelessly handled. Not much care had apparently been taken to keep it from the floor.

The *gut room* in parts has good natural light, but the windows were dirty and made of translucent wired glass. Where artificial light was needed it was inadequate. This room has good brick floor.

The *tripe room* was in a filthy condition and full of steam, it being impossible to see 5 feet.

Fat and bone room has asphalt floor, little natural light, plenty of artificial light; otherwise in good condition. Posts and slides were well painted. Overhead woodwork whitewashed.

Sausage-cooling room.—This room differed from other rooms which are used for a similar purpose in that the ceiling was waterproof, and the brine pipes were in the center of the room, reaching practically from the floor to the ceiling, surrounded by wooden shafting, with fans on either end. There was absolutely no dripping on the product.

In the *sausage-cooking room* new iron vats were observed, and in the sausage-making room the floor was very poor. This room was reasonably well lighted, both naturally and artificially.

The *lower tripe room* had a good light.

In the *sweet-pickle cellars* the product was piled on racks raised from the floor. The ceilings were very wet and water was dripping continuously.

In a *small trimming room*, located immediately off the sweet-pickle cellar, the water was dripping from the ceiling onto meat on tables where women were trimming meat. This room had no natural light. The women stand in boxes of sawdust, and most of them wear woolen headgear. The temperature was about 36° F., and some of the women were working within 4 feet of the refrigerator pipes.

The *water-closet* used by these women is located on the floor above.

On the *sheep-killing floor* the lights are practically all artificial, but the general condition of the pens and floor was very good. Whitewash and paint were in evidence, and the closets were in good condition.

The *water-closet* opened directly from the killing floor, and the partition thereof did not reach to the ceiling. One employee was observed urinating in the gutter of the killing floor.

The conditions in the *smoke rooms* and other portions of the house connected therewith are very good. The general condition of this house, when compared with the other houses visited, may be said to be very good.

The *dressing room for the beef-killing gang* is fireproof, with cement floor and ample lockers. The floor is in good condition, said to be swept twice daily, provided with steam pipes for heating, which are arranged in such fashion that the men are able to heat their dinner and coffee by placing it upon the pipes. It is supplied with natural light and good ventilation.

The *water-closet for the men* is located in a corner of the killing beds, and is not separated from the killing room.

The *dressing room for the accommodation of the employees in the casing department and beef-gut department* is airy, light, and supplied with metal lockers and steam heat. Floor is in a cleanly condition. No evidence of paint or whitewash on the sides or ceiling of this room. It is free from odor and clean.

In the *sausage-packing department* the floor is strewn with sawdust. The room is dry, well ventilated, and the ceiling is of matched lumber, with no evidence of paint or whitewash.

Smoked-beef department.—Floors are clean and in good condition, supplied with natural light, and no evidence of whitewash.

A *water-closet* is located in a corner of the main tank room, which is apparently not flushed, and was found in an insanitary condition. The main tank room has cement floors and natural light. Evidence of whitewash on sides and ceiling; windows in cleanly condition for a tank room.

It was observed that a number of places in the walls of the building, evidently originally intended for doors or windows, were sealed up. If these windows had existed, the supply of light would have been materially increased, to the benefit of the plant. In response to a request for information as to the reason why these spaces were filled in, the superintendent of the beef department stated that the spaces were walled up in accordance with the requirements of the fire underwriters.

The *boneless-ham department* is located in a room adjacent to the tank room. It was in a clean condition, celled with matched lumber, and had good artificial light. It was a damp room, with no evidence of whitewash or paint.

The room in which "C" carcasses were stored was located in one corner of the sweet-pickle room and is separated from it by a solid partition. The entrance to this room is through a door entering from the alley.

Sausage drying room.—Water was dripping from the roof on sausage.

Sausage cooling room.—Ceiling is waterproof and newly finished. Center refrigeration with fans. No dripping from the roof.

In the room next visited the committee found quantities of old sausage in barrels, some of which appeared to be spoiled.

The floor in the *sausage-making room* was clean, and the walls were whitewashed, but dirty. The windows were of translucent wired glass, fairly clean, but the natural light was not good.

Rocker sausage room.—Walls and floor good; ceiling of good material, in cleanly condition; artificial light.

Right off this room we visited a storeroom, where more old sausage was stored in large quantities. It was stated by an employee of the house that this stuff was to be tanked.

Another *sausage drying room* visited was well ventilated, clean, light and dry, painted and whitewashed.

The *cooking and canning room* was very dark and steamy, with a noisome atmosphere. Soldering and handling of sausage and other products were very close together. The fumes of the solder pervaded the room. Water was dripping from the ceiling on girls employed in soldering. These girls wore cotton protections on heads and shoulders. Generally speaking, the ceiling over the workers in this room was very wet and dripping. The hair of the girls who wore no head protection was wet. One meat stuffer was being worked in such a way that a quantity of meat was falling on the floor. From the ceiling above the conveyor large flakes and patches of whitewash were hanging, partially detached.

Another *canning room*. Good natural light, clean and dry. Soldering about 25 feet away from sausage product; no fumes of soldering noticeable. This room has an asphaltum floor, fairly dry.

Chipped-beef department.—Old wooden floors, but clean. Evidence of whitewash on walls and ceiling. Lower woodwork painted.

The *beef cutting and trimming room* was dry, whitewashed, and painted.

Eight girls are employed on soldering machines in the canning room. Four of these girls are located between sterilizers and these soldering machines.

There are no *water-closets* on the floor where the sausage rooms are located. The girls employed in these rooms are required to go to the closet on the floor above.

It was noted that the sausage which was spread in these rooms was covered with heavy oiled paper and placed on a platform 10 or 12 inches above the floor.

The water-closet for men in the canning room is separated and well flushed, though poorly lighted and ventilated.

The female employees in the chipped-beef department are provided with a water-closet accommodating six persons at a time. This closet is in a corner of the dressing room on this floor and is in a sanitary condition. This room also contains a porcelain wash-stand.

The walls are painted. A window furnished light and ventilation.

Cloakroom.—Clean, well ventilated, and well kept. Similar closet for girl painters presents the same sanitary appearance.

Beef-extract department.—Cement floor, clean windows, nicely whitewashed and painted; generally sanitary.

A room is provided for emergency cases that may arise among the employees of this plant, and is furnished with up-to-date paraphernalia, with a doctor in attendance.

Beef cutting and trimming room.—Floor incrustated with dirt. Artificial light.

Beef coolers.—Matched ceiling; no whitewash; fair condition.

Tongue cellars.—Clean; newly finished; artificial light.

ABATTOIR NO. 2.

HOG HOUSE.—The water-closet for the killing and cutting gang is located in a passageway between the hog-gut room and the tank room. The excrement was deposited in a galvanized iron trough through which a stream of water was running. The closet had natural light and was well ventilated. The windows in this house were not transparent, being made of translucent wired glass, presumably for fire protection.

The light was very good on the *killing floor*, being especially fine at the point where the head inspection is conducted. The windows of the *scraping room* were dirty. So were the windows of the canning room. The *gut room* is very wet and dirty and lacks drainage, paint, and whitewash. Artificial light was used in the gut room. The floor of the *canning room* was dry and clean and in excellent sanitary condition. It was apparent that particular care was taken to prevent any of the materials which were used in filling cans from dropping on the floor. Two persons were observed whose duty it appeared to be to keep the room in a good orderly condition.

There are spacious quarters for the employees on this floor. The *dressing room* is separate from the other quarters. The odor usual where lockers are used was observed.

The tripe canning room is located across a narrow passageway from the tank room, and the other closet for employees is in the corner of the latter compartment. The water-closet is in a sanitary condition.

The pork and bean *canning room* is located on this floor, and the employees are both men and girls. This room was very clean throughout, well lighted, and in a sanitary condition. The closet for females was in one corner. This closet has four seats, to accommodate the sixteen girls who work in this room, and also some dozen other females from other adjoining departments.

The committee was, as usual, accompanied by Doctors Bennett and Houck. In the canning room an employee from abattoir No. 2 inquired the business of the party and stated that a pass was necessary before the party could proceed. It was explained to this employee that the party was composed of inspectors of the Bureau of Animal Industry, and that Doctor Bennett was the inspector in charge of the Chicago station, to which the reply was made by another employee, who seemed to be in authority, that no Government inspector was allowed upon that floor except the employee who provided the necessary stamps. A member of the committee in the meantime went into the pork and bean canning room and was asked to secure a pass before proceeding.

The *sausage drying room* was very neat and clean; matched ceiling. The *microscopic sausage room* had windows and floor generally dirty, with window panes incrustated.

The *hog chill room* on the seventh floor was in good condition and whitewashed fairly well. *Pickle rats*, on the sixth floor, extremely clean; matched ceiling.

Hog chill rooms on the fourth and fifth floors are in good condition, with clean windows and whitewashed walls. Old house *sweet-pickle cellar* was reasonably dry, both as to floor and ceiling. The *microscopic cellar* had no racks; generally dry, but wet in spots; pork on the floor. Other portions of the cellar were fairly dry as to the floor and dry overhead; no racks; pork on the floor. The steps leading from the dry salt to the pickle cellar were covered with mud and filth. *Microscopic sweet-pickle cellar* in good condition. *Old house sweet-pickle cellar* was wet and the floor was dirty and uneven; needed paint and whitewash; men were observed sweeping. *Corned-beef room* was clean but damp; no evidence of paint or whitewash. The *ham coolers* were painted and whitewashed in irregular patches.

In a sausage drying room men were skinning broken sausage, which was examined and found to be in an apparently wholesome condition. The next room visited was a

large, clean room in which incased sausages were being washed in a machine. The *sausage packing room* was in a sanitary condition. The *sausage racking and stuffing room* had a good floor; a man was observed cleaning; the light was fair; painted and whitewashed; benches and work tables being cleaned very well. The *sausage-trimming room* was being cleaned at the time of the visit with soda and a stream of hot water under heavy pressure; evidence of whitewash and paint; clean; good light. The *pork-sausage room* is lighted entirely by artificial light; the floors cleaned and sprinkled with salt for over Sunday; painted and whitewashed, but should be renewed.

In corners of a sausage room on the fifth floor food and drink for cats are provided. Dozens of cats are kept in this plant.

Detached, well-lighted, and ventilated water-closets and dressing rooms were provided for both male and female employees in the sausage department. These accommodations were ample for the number of workers who used them.

Chopping room for domestic sausage had good floors; walls painted red 5 feet from the floor and whitewashed above; the benches were being scrubbed with hand brushes; well lighted by means of a skylight; windows fairly clean. The *ham room* was in fairly good condition; lighted by artificial light entirely; ventilated by means of a window fan and small fans on shafts of the machinery overhead; windows very clean; painted and whitewashed. Two cats were observed in the ham room. For the *sausage-smoking room* sanitary closets and enamel urinal and wash basins are provided.

Beef-killing floor.—Contains 28 beds. The light was fair; windows in a fair condition; vitrified-brick floor; overhead beams whitewashed in the past, now encrusted with dirt; walls have been recently whitewashed. The floors of the *knocking pens* have corrugated-iron slabs to prevent the cattle from slipping. The *water-closets* for the workmen on this floor are situated outside the room proper, and were in an insanitary condition.

The *killing floor for sheep and shipper hogs* is also of vitrified brick; no evidence of whitewash on the woodwork overhead, but rather the appearance of filth and age; the pillars are covered with blood and suet; the light is good; the windows in the skylight are dirty and in some instances are broken from the frames. The *water-closets* for employees on this killing floor are provided with a constant flow of water and are in a sanitary condition.

Canning department.—The first room visited was an annex to the canning department. It was well lighted by natural light passing through wire mesh located in the walls and in two rows of skylights. The walls are painted yellow 3 feet from the floor and whitewashed above. The posts are painted yellow below and whitewashed above. The girls in this room wore white caps. The floors were clean. Two sanitary water coolers, with clean cups and tumblers, were provided for the convenience of the girl employees. A slight odor of paint was apparent, but on the whole the room was well ventilated. The employees are provided with a separate room for their clothing, clean and well ventilated. The lavatory is furnished with hot and cold water and 15 porcelain wash basins. There is also a sanitary water-closet in which there are accommodations for 12 females at one time. One hundred and sixty persons use this closet. The room was well lighted and ventilated and clean in every particular. Two charwomen were in constant attendance in this room.

The labels observed were properly inscribed. One vacuum soldering machine is located very close to exposed meat products. Other machines are well removed, and there was an arrangement noted in this room for taking care of solder fumes. The trucks used to convey canned meat to and from this room were covered with clean canvas covers. This room is exceptionally clean in all particulars.

Stock Examiner Leary stated that on the day previous he had attempted to go through the canning department and had been stopped by an employee, had exhibited his official badge, and had been informed that it was necessary for him to get a pass from the office.

Storage room.—A large storage room was located adjacent to the dried-beef department. This room was fairly well lighted and fairly clean. It was noted that the product stored in this room was covered with tarred paper for protection.

Cooking, stuffing, and soldering room.—This room contained a processing machine, in which the canned product is cooked in oil, and the room is ventilated over this machine. The room is in a fair condition as to paint and whitewash, and the floor is fairly clean. The ventilation about the soldering machine is not good. Solder fumes are noticeable, and food products in open cans are handled within a foot of the soldering machine. About the stuffing machine a box is arranged on the floor to catch the falling meat. Near the cooking retorts the old clothes of the workmen were piled or hung on racks. The room was steamy, and quantities of canned veal, having the appearance of age, were observed. The rafters were much incrustated with dirt, in some places to the depth of an inch, in the vicinity of the cooking retorts. In one place a quarter-inch stream of water

was running onto the floor from a height of 3 or 4 feet. On the east side of the room the floor was very dirty. The ceiling was so arranged as to make this practically a half story. It was very dark, and all artificial light was used.

A small dressing room for men was observed, which was poorly ventilated; all artificial light. The girls employed on the soldering machines were at least 50 feet away from the sterilizers. A separate room is provided for the women's lavatory, where a wash basin and water-closet in a sanitary condition were provided. The water-closet for men was just opposite and was in cleanly condition.

The *pork-and-bean room* was very steamy, and the ventilation was poor. There was plenty of air entering this room, but no arrangement for carrying off the steam. The floor was strewn with salt for preventing putrefaction of blood, etc., in cracks and crevices.

The *tripe canning and soup room* is poorly lighted; the walls and rafters above the product are very dirty; no special ventilation was provided for the soldering machines.

In the *labeling and painting room*, where the cans are painted with blue paint by means of machines, there was no vapor from the machines. The windows were dirty. The room has been painted and whitewashed, but needs a new coat. Men were observed sweeping the floor, which was dirty. Cobwebs were noted on the ceiling and along the beams. Over the paint machines iron roofing and special ventilation were noticed. Part of the ceiling of this room was of corrugated iron. In this room there was a dressing room for the 60 female employees; this dressing room is poorly ventilated and lighted. Sanitary closets were provided. The men's water-closet is in the opposite corner of the room, not detached, and in only fair condition; well flushed, but not properly ventilated or lighted. There was a row of wall lockers for men.

Beef-extract room is fairly lighted and very clean, especially the windows. The whitewash overhead was not good; needs a new coat; lower part of walls and posts painted yellow. A dressing room for the accommodation of 28 girls, who work in this room, is provided; located at one side, but not detached. The closets are in a sanitary condition.

Extract kitchen.—Very steamy and poorly ventilated; whitewash flaking off the ceiling; floor fairly clean; a rotten, broken covering on a large overhead pipe.

The *mince-meat mixing room* is provided with artificial light, and the walls and ceiling presented the appearance of having been painted and whitewashed in the remote past; the floor was dirty. In the *ham-packing room* the floors were clean, and the room was fairly well lighted and ventilated; the whitewash and paint showed age. In this room is located a water-closet, which has no outside ventilation and is dirty and dark. The *dried-beef soldering room* is in very good condition. The *pigs'-feet room* had good light and fair paint and whitewash; the floor was wet and dirty; some product, in process of cleaning, on the floor. In the *tripe room* the light is good; no old dirt on the floor; men engaged in cleaning while the work was in progress; steamy at the end of the floor where the tripe was being cooked. A rail-seat water-closet was located at one side of this room and not detached; it was automatically flushed, but was in a filthy condition. The windows in the skylights were fairly clean.

The *chemical laboratories* and the *workrooms* in which the *medicinal products*, such as suprarenalin, pepsin, pancrétanin, etc., are prepared, were next visited. The *laboratory* proper presented the usual appearance of places of this character, and the accessories and paraphernalia were those commonly found in all well-equipped laboratories of this variety. The *extracting room*, on the sixth floor, is used for the secret processes connected with the preparations of these products, and only one employee of the laboratory has admission to all parts of this room. On the second, third, fourth, and fifth floors of this portion of the building are rooms in which these extracts are filtered, extracted, bottled or compressed, labeled, and packed. The rooms were, without exception, well lighted, naturally, and properly ventilated. The *water-closets* for the female employees were likewise clean, with modern equipment, and ample for the number of employees present. In the compartment where some of the extracts are dried large plates of glass are used, placed one above the other on racks. The rooms and the glass plates were clean and sanitary. So far as the committee was able to learn none of the Chicago packing houses manufacture a product under the name of adrenolin. The extract above referred to as suprarenalin is a similar product with a different trade name.

ABATTOIR NO. 3.

HOG HOUSE.—The *killing and trimming floors* of this house are subjected to a daily cleaning by the application of hot steaming water and washing soda. Salt is placed on the benches and on the floor of the gut room on those days preceding holidays, Sundays, and other days when no work is done. The windows in these rooms were dirty and the light is practically artificial throughout. The *water-closets* are in a very

unsatisfactory condition, and there is neither sufficient water nor frequent efficient flushing. Accumulations of excrement and paper were noticed.

The *roofs* appeared to be in good condition. No leaks were observed or reported. At no place in the plant was sausage meat observed to be exposed to water from leaky roofs. A report of a person falling into a rendering vat was obtained from Doctor Fleming, who stated that some time ago a man fell backward into a tank, causing death. This probably would not have occurred had a railing been placed about the opening. The body was recovered. He had not heard of a similar case in eleven years' experience.

In all the *dry salt cellars* the pork was on racks and not on the floor. It is customary in this house for the men to place a protection of boards about 2½ feet above the floor on the aisles for the purpose of protecting the product from the splash from squilgees, trucks, and for other purposes of cleanliness. The floors of the coolers were exceptionally dry and clean.

The *sweet-pickle cellar* is dark and dirty, and has no circulation of air. Shoulders, hams, and larger cuts of clears were being injected intramuscularly with a solution stated to be plain brine, presumably for the purpose of hastening the period of cure. An employee stated to the committee that formerly it had been the practice to inject sour hams in this way, but that the practice had been discontinued, and these hams were now sold as sour hams. A sample of this brine was taken for analysis. Several employees were interviewed with reference to the time of renovating the plant. This seemed to depend upon the necessity for such treatment, and was given as once or twice a year, nothing definite being stated. Comparatively speaking, the effects of painting and whitewash were liberally in evidence. The amount of moisture about the timbers, beams, and woodwork was much less than was observed in the abattoir No. 1, considering that at the time of the committee's visit one plant was in operation and the other was not.

Sausage house.—The water-closets were in sanitary condition, but the provision for the women could hardly be stated as ample, inasmuch as but one seat was provided for about 102 women. The water-closets for the men of this establishment were located in sheds on the second and third floors adjacent to the workrooms. While the location of these closets was fair, the closets were insanitary, in view of the fact that flushing was left until the end of each day's work.

East house.—On the gut floor of the east house was a long rail-seat closet, accommodating probably 30 men, and which was used by men on the second, third, and fourth floors. This closet was flushed by an automatic arrangement every twenty minutes from a tank on the roof of 40 gallons capacity. The urinal for the men of this building was located in the corner of the killing floor, and was provided with a constant flush.

North house.—In the north house the closet was clean and well flushed, but the location was bad. Stacks of brains were in immediate proximity to the closet, and the men were walking over viscera on their way to and from the closet.

Cellar cooling room of sausage house.—The pavement is broken, and bricks, formerly a part of the pavement, were lying on top. There are holes in the plank pavement filled with water. Meat was stored on racks; ceilings were wet, and drippings from the ceilings fell on the meat.

Sausage house.—The floors were reported to be cleaned after each day's work with soft soap and lye. This report was confirmed by the Government inspector.

East house.—Rafters above killing floor were incrustated with dirt and dust.

The *cattle-killing floor of the north house* presented a very bad appearance. Bloody, caked cleavers were noted, with much blood spattered on the walls. No evidence of paint or whitewash was apparent. Windows were not clean. *Sheep coolers* in good shape.

Sausage house.—The trimming room is not painted or whitewashed. Drying-room racks are incrustated with dirt and windows very dirty.

Domestic sausage packing room.—Some water dripping on the sausage. Lack of paint or whitewash.

Sausage-dripping room.—No paint or whitewash.

Third floor storage and packing room.—Innocent of paint.

Tripe room.—Good light, clean floor, and very cleanly benches.

Casing room.—Very good light.

Curing room.—Absence of paint and whitewash noted.

Tongue cellar.—No whitewash or paint observed. The room was very wet, and the drainage inadequate.

Men's dressing room.—Light and airy. Lack of odor noticeable. Clothes racked and not hung in lockers.

Girl's dressing room in this house was in very fair condition.

Spice rooms.—Low ceiling, rooms clean and well ventilated.

ABATTOIR NO. 22.

The *water-closets* in this canning establishment are located in separate rooms, clean in every particular, and well flushed. On the upper floors there were accommodations for 6 persons and about 100 persons to use this closet. On the lower floor of this house the *women's water-closet* was found in about the same condition, having accommodations for 4 persons at one time and about 30 persons to use it. The men's water-closets were found in equally satisfactory condition. These closets were well ventilated and satisfactorily located, at a considerable distance from where canning and similar work was being performed. In this establishment especially no closet was in close proximity to the vats in which soup was being made. We saw a female attendant in charge of each one of the women's water-closets and dressing rooms. On all the floors the lavatories provided for female workers appeared to be clean, well ventilated, and provided with porcelain wash-stands and soap and towels.

The girls in the *sausage-trimming rooms* wore nubias and heavy clothing. The temperature in this room was about 38° F. The only other room in this plant where girls were observed to have their heads covered was in the *dried-beef room*. These covers consisted of white caps similar to those worn by bakers. Several persons whose hands were wrapped up were asked as to the cause, and some said that on account of the nature of the work it was necessary to protect their hands from sharp surfaces, such as pushing skewers into carcasses, tying entrails, handling cans, etc.

In two *cellars* a small quantity of tainted meat was found.

Windows very clean, good light, and good ventilation.

ABATTOIR NO. 95.

At this establishment the beef beds are well lighted and very well ventilated. The floor is very irregular and in a filthy condition. *There are no water-closets in this establishment* for the use of the workmen. The tank room is reached by an elevator, which carries up the offal. The *retaining room* is in one corner of the cooler, not very secure. The *coolers* were in quite satisfactory condition. The *gut room* is located off from the tank room and not on the killing floor. The sanitary conditions of the gut room are about the same as those of the killing floor.

In this house the committee observed a cow, commonly known as a "downer," apparently in an unconscious condition, having been dragged in on the killing floor on a slide or chute from outside the building. When the animal was stuck it was apparent that it was not dead at the time it was knocked on the head.

ABATTOIR NO. 147.

This abattoir has been recently built and the sanitary conditions are very favorable.

The *coolers* were empty. They were new and clean.

Dressing room.—One corner of the tank room was used for the men to dress in.

Water-closets.—A one-seat water-closet in the engine room was observed for the use of the men, with an automatic flush, in first-class condition.

The *cutting room* is located on the same floor as the killing room and is furnished with good artificial light. There was no killing in progress at the time of the visit of the committee, but one cripple hog had been slaughtered and the carcass and viscera were retained for inspection by the Federal inspectors. At the time of the visit facilities for the slaughter of hogs only were found.

Killing room.—The walls of the killing floor were painted about 10 feet from the floor. The timbers above are new and are not painted or whitewashed.

The *cutting room* is amply lighted with natural light, and was clean.

ABATTOIR NO. 96.

The establishment reminds one of the typical country slaughterhouse, being indescribably filthy.

Sheep-killing room.—The sheep-killing rooms are well lighted, but the floors are incrustated with dirt to the depth of about 2 inches. The sheep are hung just off the killing beds, in the same room. The condition of this house is disgraceful, and more insanitary conditions for an abattoir can not well be imagined.

The *coolers* are old-fashioned, being chilled by the primitive method of blocks of ice.

A "downer" with bruised hindquarters had recently been dragged onto the killing floor for slaughter. The animal was reclining in a natural position and was noticed to be trembling and nervous.

The gut room was located in one corner of the building, in close proximity to the killing floor and tanks. The ceiling was low, and the room generally was in the most filthy condition of any gut room we have yet observed.

There were no water-closets in this establishment.

On March 16 the committee visited an establishment located outside the yards, which does not have Federal inspection. This abattoir is located in an old frame building, poorly adapted to the purpose. A general air of slovenliness pervades the place. Hogs are slaughtered, and killing was in progress at the time of the visit of the committee. The tanks, killing space, gutting space, and hanging space are located on the same floor, in close proximity one to the other. The *coolers* are in fair condition. Heads of hogs condemned by the city inspectors were lying around on the floor in various places. The interior bears evidence of having been whitewashed at some time in the remote past. The windows were dirty, and in some instances there was no sash in the window casings. Some of the windows were covered with cobwebs. There were one or two large openings in the roof, and the floors were incrustated with filth. The facilities for washing carcasses appeared to be inadequate, and the establishment seems to be about on a par with that of abattoir No. 96.

The *water-closet* was located on the ground floor, and contained one seat. It was without any flush and appeared filthy and unkept. One workman was observed using one corner of a near-by shed in preference to going to this closet.

The fresh bristles are stored on the same floor as the carcasses and adjoining a space where the clothing of the men is kept. Two offal tanks were located within 6 feet of the dressed carcasses.

E. Weber, M. D., Ph. Gr., of the department of health, city of Chicago, was in charge of the house at the time of the visit.

As above stated, the floor where the hogs are dressed is not well lighted, and the man who splits the carcasses used a miner's lamp on his cap in order to accomplish his purpose.

Hog carcasses are not cut in this establishment, being sold chiefly to the downtown markets.

ABATTOIR NO. 64.

This establishment was visited during the noon hour, and the killing of sheep and hogs only was in progress. All the killing and gutting is done on the same floor, which is well lighted and ventilated, but not painted or whitewashed, the timbers and walls having the appearance of being recently erected.

The killing floors and cutting floors are supplied with natural light from overhead and sides. There were new, clean *coolers* in this establishment, well supplied with artificial light and well ventilated.

The water-closet was located near the outlet of the fertilizer tanks and has a stream of water constantly passing through the trough.

ABATTOIR NO. 94.

Cattle and sheep are killed at this abattoir on the same floor. The walls of this room are painted 6 feet up from the floor and whitewashed above, and scales of whitewash appeared on the timbers and fixtures overhead. The floors of this room are very uneven and in a dirty, insanitary condition. The workmen of this establishment use one end of the tank room for a dressing room.

There are no *water-closets* in this abattoir. The workmen use a rail over the fertilizing material on an outside platform in the yard.

The coolers in this establishment were found to be in a much better condition, comparatively, than the rest of the building.

ABATTOIR NO. 24.

HOGS.—No killing was in progress at the time of the committee's visit.

The sorting room was whitewashed and well lighted, and the *cellars* were well lighted with artificial light. The fresh meats were racked for cooling.

The water-closet of this establishment was entirely detached from the building and connected with a sewer.

There is no sausage made at this establishment.

The tables and floors in the *cutting rooms* and *cellars* were found to be in good, clean condition. The natural light was not good on the *killing floor*, and the supply of artificial light was not sufficient at the gutting bench.

The dry-salt cellars are sweet, clean, and fairly dry. Burlap was observed about 1 foot from the floor around the exposed portions of the stacks of product to prevent soiling.

ABATTOIR NO. 169.

Hogs.—Killing at this house at the time of the committee's visit had just been completed. The killing floor was well lighted, the walls and woodwork whitewashed, and the windows fairly clean.

The hanging and cutting floor are in the same room. This room was well supplied with natural light, with good ventilation, and was thoroughly whitewashed.

The water-closet for the workmen in this establishment was located just off the killing floor, but was not separated from it by a partition or door, and was about 20 feet from the point where the hog carcasses are eviscerated. The sewage from the killing beds acts as a flush for this closet.

The cellars are especially clean and well lighted, artificially. Hog-cheek meat was spread on the floor of the sweet pickle cellar. The cellars were found to be clean throughout. There is not sufficient artificial light at the gut bench for the proper inspection of the viscera on dark days. The natural light is good.

The packing room of this house is located outside the building, in a shed. The windows in this plant are fairly clean. The coolers are in good shape, and the ceilings are all new matched lumber.

ABATTOIR NO. 36.

There was no killing in progress at the time of the committee's visit to this abattoir. The floor was clean and the walls and overhead fixtures whitewashed, though the windows were quite dirty, being spotted with dirt and dust. The walls and overhead timbers and fixtures of this room are whitewashed. While there are overhead windows, they were very dirty, and little natural light was admitted. The posts are painted up some 10 feet from the floor.

The cellars were in good condition, being clean and well lighted with artificial light.

The dry-salt cellar was whitewashed. The trimming room and the packing room walls and overhead were also whitewashed, and the posts in this room were painted 4 feet above the floor. An employee was noticed to have his hand wrapped up with a cloth, and upon being asked the reason, replied that he had injured his hand on a nail in a barrel and that such injuries usually healed in about two days.

The water-closet was well isolated at one end of the killing floor, under a shed, and was flushed each evening. The windows and skylights were dirty and begrimed with much dust. Artificial light was used. The floors of the killing room were being cleaned at the time of visit with soda and hot water.

The curing room was especially fine, dry, and clean. The ceiling was made of new wood.

Boiled ham and sausage rooms were clean and sweet.

The curing cellar was clean and fairly dry, with ceiling of new tongue-and-groove lumber.

Packing room clean, dry, and nicely whitewashed. Some pieces of fat used for lard were observed on the floor from a catch basin in the trimming room. The cutting benches and trimming tables are located on the killing floor on the opposite end from where the hogs are dressed.

In every hog house visited it is customary to inject salt solution intramuscularly into hams, shoulders, and other cuts of meat.

ABATTOIR NO. 198.

Beef, sheep, and calves are killed at this abattoir, although no work was in progress at the time of the committee's visit. The water-closet for the employees is located in a shed outside of the main building and over the sewer from the killing beds. The killing floor is clean. No evidence of whitewash is apparent on the walls or the ceiling. The windows are dusty. There is good natural light, plenty of ventilation, and a good, tight roof. Coolers were in fair condition and all artificial light in the coolers.

ABATTOIR NO. 15.

Fourth floor.—Sausage-drying room for microscopic sausages.—Room whitewashed and fairly clean. No dripping. The sausage for interstate trade is kept in a clean, dry, well-whitewashed room.

Third floor.—Another microscopic room for drying sausage shows no evidence of dripping, but is not so well whitewashed as the fourth floor microscopic room.

Second floor.—Hog-killing floor.—The posts are painted and the fixtures and woodwork overhead whitewashed. The windows are dirty. On this floor, and not isolated, there is a rail-seat closet, which is very insanitary, being flushed once daily.

The floors of the killing room are of wood and appear to be well scrubbed. About the gutting bench much blood and grease was noticed on the posts. There was no killing being done at the time of the visit of the committee.

On the *hanging floor* the walls and posts were painted 5 feet from the floor and whitewashed above. Two trucks, marked "U. S. Condemned Meat," were observed on this floor chained to a post. Two "poison" buckets were also chained to the post. These contained a solution of bichloride, used for disinfecting knives. The *coolers* were in fair condition. The *cutting room* is whitewashed and painted in the usual manner. The benches are clean, and the skylight furnishes good light, which is supplemented by arc lights when required.

A sanitary water-closet and urinal is located in a separate room just off the cutting room.

The *branding room* is clean and dry, and ample light is obtained from the skylight. The *gut room* is separated from other compartments, and is well lighted and clean, but not painted nor whitewashed. A water-closet, consisting of an enameled box and other necessary equipment, is provided just off this room, and is in a sanitary condition.

The dry-salt curing room.—Troughs are placed under all the overhead piping to catch the drip. The walls were whitewashed and painted in the usual manner. The ceiling was sealed. The pork in stock had burlap placed along the bottom about 15 inches above the floor along the aisles.

In the *basement* a similar sanitary cellar was noted, with large flagstone flooring. It was well drained. Another sanitary cellar adjoins this one. The *sausage room* was clean and sweet like the cellars.

Beef house.—Has a killing floor, with good light on three sides and from the skylight above. Windows fairly clean, of translucent wire-mesh glass. The floors are of wood, exceptionally well drained—practically new. A *water-closet* is located in a room just off the killing floor, and was not in extra good condition.

On the floor below the killing floor was a dressing room for the butchers. It was well isolated, ventilated, and lighted; brick floor; cement ceiling; fireproof construction. The *gut room* was clean; wooden floors, well drained. Just off the gut room a sanitary water-closet, with enameled box, is provided. Sheep and calves are killed on the beef floor. The *coolers* were in good condition, exceptionally well lighted and painted.

ABATTOIR NO. 206.

The *dressing room* was well isolated; had flagstone flooring. The lockers were of slats. Ventilation and light poor. Four rail-seat sanitary water-closets, automatically flushed, are located in this room. The *lard and tallow vats* are protected from the dust and drippings by means of a corrugated iron covering a few feet below the ceiling.

Killing floor—cattle and sheep.—Sheep were being slaughtered at the time of the visit of the committee. The windows and floors were clean. The floors were well drained. Light on two sides and two skylights. No paint or whitewash anywhere. Iron posts in cleanly condition.

The *coolers* are clean and so partitioned that each contain five rails. This prevents warm carcasses from interfering with chilling.

The *casing department* has a whitewashed ceiling and unpainted iron posts. The floors are of wood and are clean.

The *men's dressing room* is isolated, but very poorly ventilated. Metal lockers in this room.

There is a rail-seat *water-closet* some 30 feet long, well flushed.

Off from this room the *canning department* has both natural and artificial light. Clean wood floors; whitewash; no steam or vapor. In one end of this room was a large power fan for expelling steam and odors.

A *water-closet* for men was located just off the tallow room, which is poorly lighted and ventilated, although the closet is modern and well flushed. The closet for females is situated just off the butterine department, in a dressing room. The closet is well flushed and sanitary.

ABATTOIR NO. 209.

The first room visited by the committee was the *painting and labeling room*. This room was well lighted with natural light. The walls, but not the ceiling, were whitewashed. The floor was dirty. There were four *toilet rooms* in this establishment for the accommodation of employees. All were equipped with modern fittings, but the floors, except that of the women's room, were dirty and littered with paper. A *toilet room* for

the accommodation of men was located in a corner of the *rocker room*, about 10 feet from where sausage was being rocked.

Trucks containing chipped meat were standing quite near the outlet or door, which was open.

Another *toilet room* on this same floor was located in the opposite end of the room from where meat products were being handled.

On the second floor a toilet for the use of men was located, in a corner of the *canning room*, about 25 feet from where meat was being packed in cans. The *women's toilet* was located in a storeroom adjacent to the canning room. Each of these toilets was constructed to accommodate one person.

Adjoining the packing room is a room in which tongues were being trimmed and canned. It is clean, contains a small amount of steam, and is lighted by natural light. The windows are dirty.

The *sausage-draining room* is located on the first floor. No evidence of paint or white-wash; artificial light. Floors strewn with sawdust, which has been tramped over, giving it the appearance of being dirty. The *rocker room* is located adjacent to the smokehouse. Neither is whitewashed or painted. In fairly clean condition. No *dressing rooms* are provided in this establishment for the employees. Their clothing was observed hanging on the walls of the various departments where they worked. The *beef-trimming room* was in fairly clean condition. Several pieces of tainted meat were observed on the side of a table, evidently having been discarded in the trimming.

ABATTOIR NO. 11.

The first place visited was the *hog-killing floor*. Dirty, recessed windows. Floors of vitrified brick. Woodwork lacks paint and whitewash. The room was in fairly clean condition, especially the floors and benches, but on the beams above much dirt is deposited. There was a great deal of vapor condensation, and the steam pipes were leaking in several places, adding to the steam in the room. The odors from the tank room were very noticeable.

A rail-seat *water-closet* is located in the corner of the room, and is provided with an automatic flush, but was in a filthy condition.

Cattle-killing room.—Vitrified-brick floor; good light and ventilation; killing in progress; floor fairly clean, painted and whitewashed. Sides tiled to the height of 4 feet from the floor. Posts of the killing floor spattered with blood and caked with dirt. Windows dirty. There were windows on three sides and a skylight overhead. There was considerable dirt on the beams above the rail where the dressed carcasses pass.

A rail-seat *water-closet* is located in one corner of the cattle beds. This closet is not detached. It is well flushed, but dirty.

A well lighted and ventilated *dressing room* for the butchers is located over one side of the cattle beds.

Beef-boning room.—The natural light on one side of this room is good and on the other poor. There is plenty of artificial light. The windows are clean.

Tongue and heart room.—No natural light. In a fairly clean condition, but needs paint and whitewash.

The *beef coolers* throughout the house are in good condition.

Dried-beef canning room.—This room was well whitewashed, lighted, and ventilated, and was clean. There was no dripping from the roof, and the room generally was in a clean condition.

Cooking room.—Poor paint and whitewash; fairly good light. Dripping on products from overhead pipes; only fairly clean. Trucks and receptacles for meats dirty; windows dirty; portions of room very steamy, and no fans provided to carry off the steam.

Canning and stuffing room.—Windows dirty; natural light good. One corner very steamy, and odor of soldering fumes were noticeable. No special ventilation for soldering machines. There is a good water-closet in this room for the men workers. While it is removed a considerable distance from the meat products, it is not detached. Has automatic flush. Immediately adjoining is a water-closet for the female employees. This closet is in a clean condition.

Vat and retort room for cooking canned products.—This room is very steamy. Part of it is well ventilated, but other portions have practically no ventilation. The room is fairly clean.

Cellars on fourth floor.—These pickle cellars were in good condition, with sealed ceilings. No noticeable drip. Hams were being pumped with a solution in these cellars, and a sample of the solution was taken and sealed for analysis.

Labeling and painting room.—Very clean room, in a very good condition. Light good. The water-closet for the females is in a corner of the room, not detached, and has four seats for the accommodation of 100 persons. A rail-seat water-closet for men adjoins

the other closet, and was found to be clean, well flushed, painted, and whitewashed. A dressing room for females was detached and provided with lockers and lavatory, and was clean, but poorly ventilated and in need of paint and whitewash.

Fresh-meat packing room.—Products on floor, which is not extra clean. Otherwise in good condition.

Ham branding and packing room.—The floor was not dirty, and men were observed cleaning. Posts and ceiling well painted and whitewashed. The room was very steamy and the light very poor.

Dry-salt cellars.—Were in fair condition. Pork was stacked on the floor and not on racks. Burlap along aisles of pork products in cellar and branding room. Closet in corner of the pork cellar, not detached, but well flushed. This floor is provided with two dressing rooms, well lighted, ventilated, and whitewashed and painted.

Third-floor pork-curing room.—Hams were piled on racks in some portions of the room. In the same room skinned hams were found on the floor, which was not very clean. Products other than hams, some on racks, some on floor. Good ceiling and floor. Floor dirty, but men cleaning.

Fourth-floor pork curing and packing room.—This room was in fair condition; no natural light.

Fourth-floor pork-trimming room.—All artificial light. Painted and whitewashed. Pieces of meat on the floor about the workmen's feet. The water-closet for females on this floor is in a separate room, automatically flushed, adequate for the requirements. Forty persons use this closet. A dressing room is located adjoining the water-closet. It is poorly ventilated and provided with artificial light only.

Sausage, ham, and loin room.—Good light, clean condition; lacks paint and whitewash.

Sausage-hanging room.—Artificial light; clean and dry; well whitewashed; well ventilated. Adjoining this room in a wide passageway there is a water-closet for men. This closet is amply flushed, but not well lighted.

Pork-cutting room.—Natural light poor; floor dirty. In a corner of this room is a water-closet, not detached, but well flushed, and the floor and walls are clean.

Sheep-killing floor.—Fair natural light; good artificial light. Usual amount of steam; flooring good; woodwork reasonably clean. Considerable dirt overhead. Braining machine caked with blood, dirt, and grease. Windows dirty as the average. A rail-seat closet for the workmen on this floor is located just outside this room, and is dark and insanitary. *Sheep coolers* in this house were in very good condition.

The committee next visited another establishment, located inside the yards, which does not have Federal inspection and whose proprietor stated that he was about to apply for inspection. This plant is located a quarter of a mile from the nearest abattoir having Federal inspection. This is primarily a fertilizer plant, at which a few sheep are slaughtered. The owners buy offal from the uptown butchers, using fifteen wagons to collect the same. This offal is treated in the eleven tanks of the establishment.

The walls, floors, ceiling, and windows are caked and encrusted with dirt and filth. The odors and filth which pervade this entire establishment can not be described in words.

The killing floor serves the quadruple purpose of fertilizer storeroom, a killing floor, a hanging floor, and a cooler.

ABATTOIR NO. 35.

Hogs.—*The killing room* is located on the third floor. The ceiling in the neighborhood of the tanks and gut bench is low and dirty. Artificial light. A washer shuts off the light at the point where the visceral inspection is made, making it necessary to use artificial light continuously. The head inspection is conducted on the scraping bench, in a room well lighted, naturally, by a skylight, and recently whitewashed. The heads are trimmed in an adjacent room, which is also lighted similarly. Windows fairly clean.

Hanging floor.—Lower woodwork painted red, whitewashed above; salt was scattered over the floor. Good natural light. The final inspections are conducted on this floor, near the windows, which are fairly clean.

Coolers were in fair condition. Salt was sprinkled over the floors. The light was artificial.

The sausage drying and packing room is a large, well-ventilated room, well lighted by natural light. The sides and ceiling are well whitewashed, but the woodwork on which the sausage hangs was not whitewashed, but was in fairly clean condition. The brine used in pickling meats is prepared in a small, clean, well-ventilated room on the fourth floor.

Dry-salt cellar.—Clean, dry floors; burlap about 2 feet up on the product along the passageways. Posts and walls whitewashed; matched ceiling; small amount of artificial light; no dripping from the ceilings. The dry-salt cellar on the floor below was similar to

the one above, with the exception that troughs were placed along the ammonia pipes above such places where meat products were stored.

The *second and third floors* were occupied by sweet-pickle cellars, whose appearance was similar to that of the cellars in other establishments hereinbefore described. The floors were not very wet.

Dry-salt microscopic room.—The floors were rather wet, but clean; no whitewash or paint was in evidence. The brine was stated to be composed of a solution of salt and saltpeter in water, which reduces the curing period about one-half.

The *branding room* has artificial light; dirty floors; fairly well whitewashed above; red paint to a height of 4 feet from the floor.

The toilets for the accommodation of male employees are two in number and located in sheds on the bank of the river, and through which the packing-house sewers flow continuously. The toilet for the accommodation of the female employees is located in a separate room, adjacent to the cutting floor, and is provided with modern equipment. It was found to be in a sanitary condition.

Sausage trimming and roasting room.—Well supplied with natural light. The ceiling over the portion of the room where meat is handled is sealed. There is evidence of paint and whitewash. An employee was sweeping the floor during the visit of the committee.

Sausage drip room.—Was poorly lighted with artificial light, but was clean. The smokehouse adjacent was fairly well lighted with natural light and in good condition for a smoke room.

Trimming room.—Floors not very clean; light partly artificial, partly natural. Benches clean. Old paint on walls and flaky whitewash on ceiling. The room in which hams, shoulders, etc., are trimmed was well supplied with natural light; the lower woodwork was painted red, and the upper walls and ceiling whitewashed. Although trimmers were at work, the room presented a cleanly appearance. The employees in this room are supplied with lockers on the wall for their clothes.

Sausage-stuffing room.—Floors dirty. Girls wear white caps. Walls and ceiling painted and whitewashed, as above. Light fairly good; windows clean and room well ventilated.

Trimming room—top floor.—Very clean windows in the skylight and on three sides of the room, giving fine natural light. The walls of the room were painted red a distance of 5 feet from the floor and light green above, including the ceiling. The floors were clean. A large circular table, containing pork trimmings, was in the center of the room, about which 20 girls were working. The female employees of the trimming room are provided with a spacious dressing room on one side of the cutting room, and on the opposite side there is a door entering a separate toilet room, which is clean and modern in every respect.

The *sausage-stuffing room* is an adjacent room in which men are employed. The light is good, the windows clean, and the walls painted and whitewashed in the usual manner.

As hereinbefore stated, the committee took samples of the pickle which was being injected intramuscularly into hams, shoulders, and other pieces of pork, and submitted the same for analysis to the Bureau of Chemistry of the Department of Agriculture. The Bureau of Chemistry reports that each sample contains "a trace of boracic acid, probably due to a trace in the salt used, large quantities of nitrates, but no sulphuric acid or sulphites."

It may be observed that this report covers but 18 establishments having Federal inspection visited by the committee. With reference to the remaining 4 houses, it may be stated that abattoirs Nos. 146 and 147 are operated as a single abattoir, while abattoirs Nos. 35 and 125 are in the same building. The same is true of abattoirs Nos. 8 and 11. Abattoir No. 81 is not now in operation.

THE LEGAL PHASE OF THE QUESTION, INCLUDING THE SCOPE OF AUTHORITY NOW POSSESSED BY GOVERNMENT, BY THE STATE, AND BY THE CITY.

By its charter from the State, the city of Chicago controls the business of slaughtering and rendering and the inspection and condemnation of meats within its limits.

The principal provisions of the ordinances of the city of Chicago governing the business of slaughtering and rendering and the meat-inspection service, which should be considered in connection with the Federal meat inspection, are sections 1120, 1121, 1153, 1154, 1157, 1158, and 1210 to 1218, inclusive, of the Municipal Code of Chicago (1905).

Section 1120 places the superintendent and bacteriologist in charge of the milk and food division of the department of health, and he, with the chemist, is directed to make analyses and examinations of meat. Section 1121 provides that the superintendent and bacteriologist shall be in charge of the meat inspectors. Section 1153 reads as follows:

1153. *Condemnation of meat.*—All meat condemned in the city by Government or State meat inspectors shall be destroyed under the supervision and subject to the directions of

the city meat inspectors; and the city meat inspectors, or any one of them, are hereby empowered to seize, condemn, and destroy any tainted or unwholesome meat found in the city; and the city meat inspectors, or any one of them, are hereby authorized to enter any building, structure, or premises in the city to inspect and examine any meat contained therein.

Section 1154 prescribes the hours of slaughter, and provides certain sanitary regulations. Section 1157 forbids the slaughtering of cattle in the city, except in a duly licensed slaughterhouse. Section 1158 provides that all slaughterhouses shall be thoroughly cleansed and purified, and all offal, blood, fat, garbage, refuse, and unwholesome or offensive matter to be therefrom removed at least once in every twenty-four hours after the use thereof, and that all woodwork, save floor and counters, thoroughly painted or whitewashed. Sections 1210-1218, inclusive, provide for the licensing and general method of conducting the business of slaughtering and rendering, prescribe the method of destroying offensive odors, and forbid offensive smells, the use of the streets for certain purposes, the rendering of animals unfit for food, and the lodging of employees in slaughterhouses. In general, it may be said that the ordinances on this subject are complete and far-reaching. If enforced, they should produce an ideal condition in the slaughtering district.

LAW UNDER WHICH THE STATE OF ILLINOIS INSPECTS MEAT AT CHICAGO.

It is maintained with some force by the health authorities of the city of Chicago that the State of Illinois has no authority to maintain any meat inspection service in the city of Chicago, from the fact that this power was granted to the city in its charter. The live-stock commissioners of the State of Illinois claim the authority to supervise the slaughter of all cattle found in the Chicago stock yards affected with actinomycosis, under chapter 8, section 48, page 154, of the Revised Statutes of Illinois (1903), and cite as further authority an agreement with the Chicago Live Stock Exchange, which represents the owners of such diseased animals. Section 48 reads as follows:

48. *Quarantine—Duty of commissioners—Slaughter of diseased animals—Appraisement.*—2. It shall be the duty of said board of commissioners to cause to be investigated any and all cases or alleged cases coming to their knowledge of contagious or infectious diseases among domestic animals, and to use all proper means to prevent the spread of such diseases, and to provide for the extirpation thereof; and in the event of reasonable grounds for belief that any such contagious or infectious disease has broken out in this State, it shall be the duty of the person owning or having in charge any animal or animals infected with disease, or any other person having knowledge or reason to suspect the existence of such disease, to immediately notify said board of commissioners, or some member thereof, by communication to said board, of the existence of such disease; and thereupon it shall be the duty of said board, or some member thereof, or authorized agent of the board, immediately to cause proper examinations thereof to be made, and if said disease shall be found to be a dangerously contagious or dangerously infectious malady, said board, or any member thereof, or the State veterinarian, or any of the assistant veterinarians, shall order said diseased animals, and such as have been exposed to contagion, and the premises in which they are, to be strictly quarantined for such time as the board or any member thereof or such veterinarian may deem necessary, in charge of such person as the board or any member thereof or such veterinarian shall designate, and they shall have power to order any premises and farms where the disease exists or has recently existed, as well as exposed premises and farms, to be put in quarantine, so that no domestic animal which has been or is so diseased or has been exposed to such contagious or infectious disease be removed from the places so quarantined, nor allow any healthy animal to be brought therein, except under such rule or regulation as the board may prescribe; and said board shall prescribe such regulations as they may deem necessary to prevent such disease from being communicated in any way from the places quarantined. In all such cases of contagious and infectious diseases the said board, or in case the number of animals shall not exceed five any member thereof, shall have power to order the slaughter of all such diseased and exposed animals. The said board shall have power to cause to be destroyed all barns, stables, premises, fixtures, furniture, and personal property infected with any such contagious or infectious disease, as far as in their judgment may be necessary to prevent the spread of such disease and where the same can not be properly disinfected. When the board, upon the written report of the State veterinarian, or any of his assistants, determine that any animal is infected with, or has been exposed to, any dangerously contagious or infectious disease, the board, or any member thereof, may agree with owner upon the value of such animal or property, and in case such agreement can not be made said board, or the member acting in behalf of the board, may appoint three disinterested citizens of the State to appraise such diseased animal or exposed animals or property. Such appraisers shall subscribe to an oath, in writing, to fairly value such animal in accordance with the requirements of this act, which oath, together with the valuation fixed by said appraisers, shall be filed with the board and be preserved by them. Upon such appraisement being made it shall become the duty of the owner to immediately destroy such animals and dispose of the same in accordance with the order of said board or member thereof, and upon failure to so do said board or member thereof shall cause such animal or animals or property to be destroyed and disposed of, and thereupon the said owner shall forfeit all right to receive the compensation allowed by said appraisers and provided for by this act. When the board, upon the written opinion of the State veterinarian, determines that any barns, stables, outbuildings, or premises are so infected that the same can not be disinfected, they may quarantine such barns, stables, outbuildings, or premises from use for the animals that may be infected by such use, and such quarantine shall continue until removed by the board, and a violation of such quarantine shall be punished as is provided for violations of other quarantine by this act. (As amended by act approved June 15, 1887. In force July 1, 1887, L. 1887, p. 13; Legal News Ed., p. 30.)

LAWS UNDER WHICH THE DEPARTMENT OF AGRICULTURE MAINTAINS MEAT INSPECTION.

The laws under which the Department of Agriculture maintains the meat-inspection service of the Bureau of Animal Industry are the act of August 30, 1890; entitled "An act providing for an inspection of meats for exportation, prohibiting the importation of adulterated articles of food or drink, and authorizing the President to make proclamation in certain cases, and for other purposes" (26 Stat., 414); the act of March 3, 1891, entitled "An act to provide for the inspection of live cattle, hogs, and the carcasses and products thereof which are the subjects of interstate commerce, and for other purposes" (26 Stat., 1089), as amended by the act of March 2, 1895 (28 Stat., 732), and certain provisions of annual appropriation acts for the Bureau of Animal Industry.

That portion of the act of August 30, 1890, which relates to meat inspection, reads as follows:

Be it enacted, etc., That the Secretary of Agriculture may cause to be made a careful inspection of salted pork and bacon intended for exportation, with a view to determining whether the same is wholesome, sound, and fit for human food, whenever the laws, regulations, or orders of the government of any foreign country to which such pork or bacon is to be exported shall require inspection thereof relating to the importation thereof into such country, and also whenever any buyer, seller, or exporter of such meats intended for exportation shall request the inspection thereof.

Such inspection shall be made at the place where such meats are packed or boxed, and each package of such meats so inspected shall bear the marks, stamps, or other device for identification provided for in the last clause of this section: *Provided,* That an inspection of such meats may also be made at the place of exportation if an inspection has not been made at the place of packing, or if, in the opinion of the Secretary of Agriculture, a reinspection becomes necessary. One copy of any certificate issued by any such inspector shall be filed in the Department of Agriculture, another copy shall be attached to the invoice of each separate shipment of such meat, and a third copy shall be delivered to the consignor or shipper of such meat, as evidence that packages of salted pork and bacon have been inspected in accordance with the provisions of this act and found to be wholesome, sound, and fit for human food; and for the identification of the same such marks, stamps, or other devices, as the Secretary of Agriculture may by regulation prescribe, shall be affixed to each of such packages. Any person who shall forge, counterfeit, or knowingly and wrongfully alter, deface, or destroy any of the marks, stamps, or other devices provided for in this section on any packages of any such meats, or who shall forge, counterfeit, or knowingly and wrongfully alter, deface, or destroy any certificate in reference to meats provided for in this section shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding one thousand dollars or imprisonment not exceeding one year, or by both said punishments, in the discretion of the court. (26 Stat., 414.)

The act of March 3, 1891, as amended by the act of March 2, 1895, reads as follows:

AN ACT To provide for the inspection of live cattle, hogs, and the carcasses and products thereof which are the subjects of interstate commerce, and for other purposes. (26 Stat., 1089.)

INSPECTION OF CATTLE INTENDED FOR EXPORT; INSPECTORS; CERTIFICATES; CLEARANCE OF VESSELS.

Be it enacted, etc., That the Secretary of Agriculture shall cause to be made a careful inspection of all cattle intended for export to foreign countries from the United States at such times and places and in such manner as he may think proper, with a view to ascertaining whether such cattle are free from disease; and for this purpose he may appoint inspectors, who shall be authorized to give an official certificate clearly stating the condition in which such animals are found, and no clearance shall be given to any vessel having on board cattle for exportation to a foreign country unless the owner or shipper of such cattle has a certificate from the inspector herein authorized to be appointed, stating that said cattle are sound and free from disease.

INSPECTION OF CATTLE WHOSE MEAT IS TO BE EXPORTED.

SEC. 2. That the Secretary of Agriculture shall also cause to be made a careful inspection of all live cattle, the meat of which, fresh, salted, canned, corned, packed, cured, or otherwise prepared, is intended for exportation to any foreign country, at such times and places and in such manner as he may think proper, with a view to ascertain whether said cattle are free from disease and their meat sound and wholesome, and may appoint inspectors who shall be authorized to give an official certificate clearly stating the condition in which such cattle and meat are found, and no clearance shall be given to any vessel having on board any fresh, salted, canned, corned, or packed beef, being the meat of cattle killed after the passage of this act for exportation to and sale in a foreign country from any port in the United States until the owner or shipper shall obtain from an inspector appointed under the provisions of this act a certificate that said cattle are free from disease and that their meat is sound and wholesome.

INSPECTION OF CATTLE, ETC., INTENDED FOR INTERSTATE COMMERCE.

SEC. 3. The Secretary of Agriculture shall cause to be inspected prior to their slaughter all cattle, sheep, and hogs which are subject of interstate commerce and which are about to be slaughtered at slaughterhouses, canning, salting, packing, or rendering establishments in any State or Territory, the carcasses or products of which are to be transported and sold for human consumption in any other State or Territory or in the District of Columbia, and in addition to the aforesaid inspection there may be made in all cases where the Secretary of Agriculture may deem necessary or expedient, under rules and

regulations to be by him prescribed, a post-mortem examination of the carcasses of all cattle, sheep, and hogs about to be prepared for human consumption at any slaughterhouse, canning, salting, packing, or rendering establishment in any State or Territory or the District of Columbia which are the subjects of interstate commerce.

REGULATIONS FOR EXAMINATION OF CARCASSES AND PRODUCTS OF CATTLE, ETC.; IDENTIFICATION MARKS; FORGERY, ETC., OF MARKS, ETC.; PENALTY.

SEC. 4. That said examination shall be made in the manner provided by rules and regulations to be prescribed by the Secretary of Agriculture, and after said examination the carcasses and products of all cattle, sheep, and swine found to be free of disease and wholesome, sound, and fit for human food shall be marked, stamped, or labeled for identification as may be provided by said rules and regulations of the Secretary of Agriculture. Any person who shall forge, counterfeit, simulate, imitate, falsely represent, or use without authority, or knowingly and wrongfully alter, deface, or destroy any of the marks, stamps, or other devices provided for in the regulations of the Secretary of Agriculture, or of any such carcasses or their products or who shall forge, counterfeit, simulate, imitate, falsely represent, or use without authority, or knowingly and wrongfully alter, deface or destroy any certificate or stamp provided in said regulations shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding \$1,000 or imprisonment not exceeding one year, or by both said punishments, in the discretion of the court.

TRANSPORTING UNSOUND CARCASSES PROHIBITED; PENALTY.

SEC. 5. That it shall be unlawful for any person to transport from one State or Territory or the District of Columbia into any other State or Territory or the District of Columbia, or for any person to deliver to another for transportation from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia the carcasses of any cattle, sheep, or swine, or the food products thereof, which have been examined in accordance with the provisions of sections 3 and 4 of this act, and which on said examination have been declared by the inspector making the same to be unsound or diseased. Any person violating the provisions of this section shall be deemed guilty of a misdemeanor and punished for each offense as provided in section 4 of this act.

OFFICIAL CERTIFICATES FOR SOUND CATTLE, ETC., AND THEIR CARCASSES, ETC.

SEC. 6. That the inspectors provided for in sections 1 and 2 of this act shall be authorized to give official certificates of the sound and wholesome condition of the cattle, sheep, and swine, their carcasses and products described in sections 3 and 4 of this act, and one copy of every certificate granted under the provisions of this act shall be filed in the Department of Agriculture, another copy shall be delivered to the owner or shipper, and when the cattle, sheep, and swine or their carcasses and products are sent abroad a third copy shall be delivered to the chief officer of the vessel on which the shipment shall be made.

ACT NOT TO APPLY TO ANIMALS SLAUGHTERED BY FARMERS.

SEC. 7. That none of the provisions of this act shall be so construed as to apply to any cattle, sheep, or swine slaughtered by any farmer upon his farm, which may be transported from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia: *Provided, however,* That if carcasses of such cattle, sheep, or swine go to any packing or canning establishment and are intended for transportation to any other State or Territory or the District of Columbia, as hereinbefore provided, they shall there be subject to the post-mortem examination provided for in sections 3 and 4 of this act.

A provision in the appropriation act for the Bureau of Animal Industry for the fiscal year 1896 reads as follows:

The Secretary of Agriculture is hereby authorized to make such rules and regulations as he may decide to be necessary to prevent the transportation from one State or Territory or the District of Columbia into any other State or Territory or the District of Columbia, or to any foreign country, of the condemned carcasses or parts of carcasses of cattle, sheep, and swine, which have been inspected in accordance with the provisions of this act. Any person, company, or corporation owning or operating any such slaughterhouse, abattoir, or meat curing, packing, or canning establishment, or any employee of the same, that shall willfully violate any provision of this act shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished for each offense by a fine not exceeding one thousand dollars or imprisonment not exceeding one year, or by both said punishments, in the discretion of the court. (28 Stat., 732.)

A provision in the appropriation act for the Bureau of Animal Industry for the fiscal year 1901 reads in part as follows:

* * * *Provided further,* That the Secretary of Agriculture may, in his discretion, waive the requirement of a certificate with beef and other products which are exported to countries that do not require such inspection. * * * (31 Stat., 202.)

An item in the urgent deficiency act, approved February 27, 1906, is the first specific authority of law for the microscopic inspection of pork. The item reads:

Bureau of Animal Industry: Additional, to meet the demands for more meat inspection and for microscopic inspection of pork, sixty-three thousand dollars, or so much thereof as may be necessary.

CONCLUSIONS AND RECOMMENDATIONS OF THE COMMITTEE.

In practice the provisions of the act of August 30, 1890, *supra*, relating to meat inspection, have been found useless, for the reason that foreign countries would not admit meat which had been inspected in accordance with the terms of the act.

The act of March 3, 1891, as amended by the act of March 2, 1895, *supra*, deserves careful attention, for in these provisions of the Federal statutes lies practically all the power of the Department to inspect those food animals and their products which are the subject of export and of interstate commerce.

It will be noted that the provisions of this act are directed toward two purposes, viz :

1. The inspection of all *live cattle* which are intended for export or whose carcasses or products are intended for export.

2. The mandatory ante-mortem inspection of cattle, sheep, and hogs which are subjects of interstate commerce and which are about to be slaughtered at slaughterhouses, canning, salting, packing, or rendering establishments in any State or Territory, the carcasses or products of which are to be transported and sold for human consumption in any other State or Territory or the District of Columbia; and

2a. The additional permissive post-mortem examination of the carcasses of all cattle, sheep, and hogs about to be prepared for human consumption at any slaughterhouse, canning, salting, packing, or rendering establishment in any State or Territory or the District of Columbia, and which are the subjects of interstate commerce.

The ante-mortem inspection is made mandatory upon the Secretary of Agriculture, while the post-mortem examination rests in his discretion.

Section 4 of the act requires that, after said examination, the carcasses and products of all cattle, sheep, and swine found to be free of disease and wholesome, sound, and fit for human food shall be marked, stamped, or labeled for identification. The section further provides a penalty for forging, counterfeiting, or simulating, or for using without authority or for wrongfully altering, defacing, or destroying the Government stamp, *but is silent, as is the entire act, upon the subject of marking and rendering unfit for food purposes the carcasses and products of all cattle, sheep, and swine which on inspection are found to be diseased, unwholesome, unsound, and unfit for human food.* It is true that section 5 of this act provides that it shall be unlawful to transport interstate the carcasses of any cattle, sheep, or swine, or the food products thereof, which upon inspection are found to be unsound and diseased, and by a provision of the act of March 2, 1895, *supra*, the Secretary of Agriculture is authorized to make regulations to prevent the transportation, interstate or to a foreign country, of condemned carcasses or parts thereof; but neither of these provisions is adequate. It is also true that the Department does cause to be destroyed, under the supervision of its inspectors, all carcasses condemned as unfit for food, but this practice has not the sanction of law. If the proprietor of an establishment declines to destroy meat condemned as unfit for food by a Federal inspector, the Department has no remedy other than a withdrawal of Federal inspection from such establishment.

The law provides that a clearance shall not be given to any vessel which has on board cattle, beef, or beef products until a certificate is had from a Federal inspector that the cattle are free from disease and the meat sound and wholesome. No similar provision obtains for the interstate transportation of carcasses and food products of cattle, sheep, and swine. The law directs the Secretary to cause to be inspected *all* cattle, sheep, and swine slaughtered at slaughterhouses, canning, salting, packing, or rendering establishments the carcasses or products of which are to enter into interstate commerce, but the annual appropriation has never been sufficient to enable the Bureau to cover all establishments slaughtering for the interstate trade; indeed, some establishments which have applied for inspection have been refused on account of lack of money to carry on the work. There is nothing in the law to forbid any carrier from accepting for interstate transportation carcasses and food products which have not had Federal inspection. The mischief caused by not providing and requiring Federal inspection for *all* establishments slaughtering for the interstate trade is illustrated by a preceding paragraph of this report, which shows the wide discrepancy between the number of animals rejected on ante-mortem inspection and the number of these rejects slaughtered, and also by the statement made to a member of the committee by a responsible employee of the Bureau of Animal Industry at Chicago to the effect that two men had, to his knowledge, made fortunes by buying animals which were rejected by Government inspectors on the ante-mortem inspection and slaughtering them in establishments which did not have Federal inspection. That the packing-house interests recognize that they are not required by the law to submit their products to Federal inspection is evidenced by the statement of one of the largest packers in a recent magazine article. He says:

The inspection by the United States Government is *not compulsory on the packers in the strict legal sense of the term*; it is more binding than if it were compulsory. *It is business.*

The question of the legal right of the Department to condemn tainted meat found in canning establishments, which meat is part of carcasses which have theretofore passed the post-mortem inspection by Federal inspectors and have been duly marked as having

so passed, is, in view of the lack of a sufficient appropriation to do the work, largely academic. It is very dubious, however, whether such power is granted by existing law. When the carcass is once stamped as unfit for food the statutes make no provision for following it further. To be sure the Department can require such establishments to either destroy such tainted meat or to suffer the withdrawal of Federal inspection, but, in view of the fact that the product may be placed in interstate trade without inspection the remedy does not appear to be adequate.

The committee is unable to find any authority of law for the microscopic inspection and certification of pork for exportation to foreign countries, except a provision in the annual appropriation act for the Bureau of Animal Industry, which provides that the Secretary may use so much of the sum appropriated as he deems necessary for promoting the extension and development of foreign markets for dairy and other farm products of the United States, and the item in the urgent deficiency bill of February, 1906, hereinbefore referred to. In view of the fact that the meat-inspection acts mentioned in the appropriation act confine inspection and certification for export to *cattle*, it is doubtful whether the first provision quoted was intended by Congress to authorize inspection and certification of pork for export. The effect of the provision in the urgent deficiency bill ceases with the end of the present fiscal year.

The microscopic inspection of pork and the certification based thereon were instituted by the Department in 1891 after Germany had refused to accept pork and pork products inspected in accordance with the provisions of the act of August 30, 1890.

Bearing in mind the facts disclosed by the investigation and by an examination of the statutes upon which Federal meat inspection rests, the committee makes the following recommendations:

1. That the Federal inspectors shall be empowered and required by law to mark and otherwise render unfit for food purposes, in accordance with the rules and regulations of the Secretary of Agriculture, the carcasses and products of all cattle, sheep, and swine which, on post-mortem inspection, are found to be diseased, unwholesome, unsound, and unfit for human food.

While it is true that in legislation of this character it is important to bear in mind the line of demarcation between commerce and manufacturing, the limitations of the Federal jurisdiction, and the extent of the police power of the State and of the municipality, it is thought the above recommendation, if enacted into law, would be within the powers of the United States.

2. That the carriers be prohibited by law from transporting from one State or Territory or the District of Columbia into another State or Territory or the District of Columbia the carcasses, or any portion thereof, of any cattle, sheep, or swine which have been slaughtered at any slaughterhouse, canning, salting, packing, or rendering establishment, unless the said carcasses or portions thereof shall be marked, in accordance with the regulations of the Secretary of Agriculture, to show that the said carcasses or portions thereof have been inspected in accordance with the terms of the act of Congress of March 3, 1891.

Such a provision would make Federal inspection compulsory upon all establishments doing an interstate business, and would thus do away in large measure with the killing of animals rejected by inspectors on ante-mortem inspection by establishments not having Federal inspection. It would render the inspection so valuable and essential that the menace of its withdrawal would be sufficient to secure a full compliance with the regulations. Of course, the provision here recommended would be worse than useless unless an appropriation can be secured sufficiently large to enable the Department to extend inspection to all establishments slaughtering for the interstate trade.

3. That the Secretary of Agriculture shall be by law directed to examine into and to make rules and regulations governing the sanitary conditions of and the soundness and fitness for food of the product of all slaughtering, canning, rendering, salting, or packing establishments whose product enters into interstate or foreign trade, and to refuse to certify to or to permit the statement that the product is "U. S. Inspected" to be placed upon the product, unless the said establishment shall be conducted in accordance with the said rules and regulations.

4. That legislation be asked explicitly authorizing the inspection and certification of pork for export, the cost of such microscopic inspection to be defrayed by the establishment for whose benefit the inspection is made.

5. It is apparent to the committee that the number of Federal employees in the receiving, canning, and packing departments of the different establishments is wholly inadequate to supervise the work properly, and it is especially recommended that provision be made for sufficient additional employees to keep a close check between the inspected meat and the products which leave the establishments, and also to more closely supervise the distribution and affixing of Government meat-inspection stamps;

or, if it be impossible to provide the additional men required for this supervision, that the regulations be changed to require the inspection legend on trade labels to show that the Federal inspection referred to was an inspection of the animal from which the meat came at the time of slaughter.

6. It is recommended that all carcasses designated as "cannera" shall be marked at the time of slaughter by a brand or label affixed to each quarter thereof.

7. That no Government seal on rendering tanks shall be broken except by a Federal employee.

8. That all offal, fertilizer, and grease tanks shall be located in separate compartments isolated from food products.

9. That sufficient natural light shall be provided for conducting all final post-mortem inspections outside of the coolers.

10. That the Bureau of Animal Industry employees shall at all times have access to all portions of establishments at which Federal inspection is maintained.

11. That the three post-mortem inspections of swine shall be reported separately by the three employees who make them.

12. That all large rooms in which the microscopic meat is stored shall be so constructed that an alleyway, with slat partitions, will lead through, thus doing away with the necessity of having manholes or unlocked gates. Solid doors could then be made to open into each compartment, which would permit the Department to control more efficiently the contained meats. In the case of small rooms, a glass window could be inserted in the partition, and in the event of fire it could be broken out and the room entered without delay.

13. That consideration be given the following suggestions: An ideal way of handling all animals tagged on ante-mortem inspection in the stock yards would be to have them sent to one official abattoir for slaughter. The objectionable features of this plan would be the desire of different owners to choose different abattoirs and the probability of other establishments competing for this business. Of course, this latter objection could be obviated in part by having the various houses bid for the slaughter of the rejects for the week or month.

14. That in those cases where the doors of water-closets were observed to open into a room where meat was being handled, such doors be closed and other entrances afforded. It is further strongly recommended that the cleanliness and care of some of these closets be given greater consideration.

15. That more attention be given to the whitewashing and painting of those rooms in the establishment where meat products are handled.

16. That those rooms containing excessive quantities of steam be supplied with power exhaust fans, or some other means of improving the condition.

In closing this report, the committee desires to state that, so far as it was able to observe, the force of the Department at Chicago is doing its full duty intelligently, squarely, and unflinchingly. But the fact should not be lost sight of that, in the opinion of the committee, the force employed at Chicago is, as a whole, inadequate numerically to inspect and supervise properly the work of slaughtering, rendering, packing, canning, and other various processes.

Respectfully submitted.

JOHN R. MOHLER,
Chief Pathological Division, Bureau of Animal Industry,
RICE P. STEDDOM,
Chief Inspection Division, Bureau of Animal Industry,
GEO. P. MCCABE,
Solicitor Department of Agriculture,
Committee.

SUPPLEMENTAL REPORT OF DEPARTMENT COMMITTEE COMMENTING ON CERTAIN PUBLICATIONS REFLECTING ON THE MEAT INSPECTION.

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF THE SOLICITOR,
Washington, D. C., April 13, 1906.

The CHIEF OF THE BUREAU OF ANIMAL INDUSTRY,
Department of Agriculture.

SIR: In addition to the complete report heretofore submitted, the committee appointed by you to examine and report upon the meat-inspection service of the Bureau of Animal Industry at Chicago and the condition of the abattoirs as to sanitation has prepared a statement giving the charges which have been published in various places from time to time reflecting upon the character of the work at that place, and submits comments based upon information gathered from personal observation.

Quotations from articles which have appeared in Volume CLXVIII of the Lancet, under the captions of "Chicago" and "The Chicago Stock Yards," by its special sanitary commissioner.

[The Lancet, January 7, 1905.]

1. As for all the principles of sanitation laid down to govern the construction of abattoirs, these were ignored from first to last; consequently the insecurity is so great that several nations of the more civilized parts of the world have thought it necessary to enact special laws against Chicago.

1. The process of slaughtering cattle and packing the product is carried on in Chicago on a colossal scale, and it is true, in many instances, sanitary features, such as light and air, are sacrificed to increase the capacity of the plants. The reference to special legislation against Chicago by several foreign nations undoubtedly refers to the requirements of these nations that all pork from the United States shall be microscopically inspected for trichinae.

2. The importation of pork products from Chicago to Germany, Austria, France, and Denmark is prohibited unless accompanied by a certificate issued, not by any local authority, but by the Government of the United States itself.

2. A microscopic examination of pork shipped from the United States is required by Germany, France, Denmark, Italy, and Austria. This requirement applies not only to pork from Chicago, but to all pork from any part of the United States.

3. Therefore the cattle, hogs, and sheep, even at the Berlin rate for slaughterhouse fees, would at Chicago bring in at least \$4,800,000 per annum. But a great amount of poultry is killed here, and there is also a very large horse market, so that the present amount of business done might easily bring in more than \$5,000,000, or £1,000,000 sterling, per annum to the Chicago municipality.

3. The inference that horses are slaughtered for meat in Chicago is erroneous and without foundation in fact, so far as this committee is aware. The municipal ordinances of Chicago not only forbid this practice, but make it a misdemeanor to have horse meat in one's possession.

[The Lancet, January 14, 1905.]

4. The animals were killed, not in abattoirs, but in mills or factories—huge, hideous, box-shaped buildings, five and six stories high. Private slaughterhouses were, not generally, very defective when judged from the sanitary point of view; still they are preferable to slaughtering in factories. The number of animals killed is much smaller than in factories, and this is done not upstairs, but on the ground, and in a little building like a stable, where there is no difficulty in obtaining air and light. * * * Nowhere could I discover the smallest trace of a slaughterhouse.

4. Accepting the author's definition of a slaughterhouse, it may be stated that in Chicago abattoirs No. 94, No. 95, No. 96, and No. 198, all having Federal inspection, comply with these specifications. It should be stated further that the sanitary condition of one of the above slaughterhouses was so poor that inspection has been withdrawn since the report of the committee was submitted.

5. At the Chicago stock yards I could not but feel scandalized and humiliated when I saw the foul and abominable premises in which the representatives of science, the representatives of the United States of America, the representatives of the majesty of the law condescended to work daily in the accomplishment of their mission.

5. The Federal inspectors in abattoirs are required to make a post-mortem examination of the animals at the time they are eviscerated and dressed. Under the most favorable conditions this work would not be considered by the majority of persons as being pleasant. There is, however, room for improvement in the facilities for the personal comfort of the inspectors at some of the plants.

6. As they (cattle) approach the outer wall, men strike them on the head with a mallet; then a sort of wooden partition gives way and lets the half-stunned animals fall into the basement of the building and beyond. As they come tumbling in, men seize their hind legs, affix ropes, etc.

6. The cattle are stunned in the knocking pens, after which a lever is pulled, causing the floor of the pen under the animal to tilt simultaneously with the lifting of the door. This permits the animal to roll out on the adjacent killing floor, a distance of about 2 feet below the level of the knocking pens. Should half-stunned animals fall any considerable distance, such as is inferred from the above paragraph, they would become so bruised as to lower their market value.

7. Then, when strung up, the machinery carries the living animal forward and men have to run after it to cut its throat.

7. The stickers employed by the packing-house firms to bleed the cattle are active and adroit, but the committee observed that it was unnecessary for these men "to run after" an animal in order to cut its throat.

8. Sometimes the cattle are struck down and stunned more quickly than the men can pick them up and cut their throats, so they are left alive some time suspended in the air by their hind feet.

8. The only cases where live cattle were observed to be suspended in the air by their hind feet were animals to be killed by the Jewish method of shechtering. When an animal is struck down and stunned it is unconscious, practically dead, and it was noted that only a few seconds elapsed between the suspension of such an animal and the time it was bled.

9. There are innumerable rafters, sharp angles, nooks, and corners where blood, the splashing of offal, and the sputum of tuberculous workers can accumulate for weeks, months, and years. It does not look as if the floors are ever really clean, though I am told they are occasionally scrubbed.

9. There are killing floors in Chicago which this quotation aptly describes without exaggeration. There are other killing floors which are kept as clean as the nature of the work will permit, with vitrified brick floors, painted walls, and whitewashed posts and rafters. The floors of many of the killing departments and workrooms where meat is handled are scrubbed daily with caustic soda, pine tar, and boiling hot water, the floors then being dried with rubber squeegees and sprinkled with salt.

10. * * * Here is the evidence of the windows, about which there can be no doubt, and they are heavily caked with dirt.

10. The windows in some of the establishments are dirty; in others, clean. Some windows are caked with dirt on the inside and others are only soiled on the outside by soot and dust.

11. * * * It is safer to buy meat from the small retail municipal slaughterhouse of a petty, provincial town than from the world-wide provision packers of Chicago.

11. Government inspection is maintained at practically all of the abattoirs in Chicago, and during a single year many thousand diseased carcasses are condemned as unfit for human food and are converted into grease and fertilizer, thus insuring their destruction. If these animals were slaughtered in abattoirs in small towns where no inspection exists, they would undoubtedly be used for food.

12. Close at hand there are closets, and they are in some places only a few feet from the food. These closets are at times out of order, deficient, defective, or even entirely devoid of flushing. They are all the more offensive as they are not sufficiently numerous for the large staff of workers who have to use them. This is especially the case in one of the rooms where soup is made for preserving in tins. In one department there were two closets, neither of which could be flushed, provided for 80 women. * * * Even to-day, after many protests and agitations, there are no lavatories for the workers to wash themselves conveniently and to change some of their clothes before they begin handling the food which is sent from Chicago to all parts of the world.

12. It is true that in a small number of establishments water-closets are located only a few feet away from the food product, not even separated therefrom by complete partitions, and in a small percentage of the total number of closets examined by the committee the arrangements for flushing were defective, and in the same small percentage of cases the closets were not sufficiently numerous for the number of workers who use them. Generally speaking, however, the closets were ample in number, and the facilities for flushing were all right; but sufficient care is not taken to keep them clean, and the location of many of them is bad. The above comments apply to the criticism of lack of lavatory and dressing-room facilities. Many of the establishments have large and commodious dressing rooms for both the male and female workers, and lavatories are generally provided for the women, but there are few lavatories for the men.

13. For instance, I was told that diseased and condemned carcasses which were put in at one end of the destructor to be converted into manure were promptly extracted at the other end and sold as meat.

13. For years rumors have been current that condemned carcasses, properly tanked, were reclaimed and sold for food. Careful precautions are taken to prevent this action. The condemned meat is required to be placed in the tanks in the presence of an inspector, and the openings at both the top and bottom of the tank are sealed with Government seals and the steam turned on. The author himself in the same article says: "When a carcass, or a portion of a carcass, is condemned, in spite of stock-yard gossip and scandal, I believe that it is conscientiously destroyed."

14. * * * So that when stories go round about the selling of diseased meat the persons who tell them are either deliberately inventing or, more probably, confusing an ordinary cauldron with the destroying tanks.

14. This statement is believed to be correct.

15. Also I was told that bruised and rejected hams were nevertheless sold and put on the market by cheap butchers, or else the bone may be cut out and the discolored portion of the flesh near the bone removed, the rest being utilized; again, when meat that has been put in brine for pickling is found to smell, hollow needles are driven into the flesh and brine is pumped into the body of the meat. This saves the time of penetration, and men have assured me that when meat still retained an unpleasant odor the operation was repeated. Nevertheless, I find some difficulty in believing these stories.

15. Hams rejected by the Federal inspectors are not permitted to be sold. Hams of healthy animals which are slightly bruised may be trimmed and the normal portion used for food. It is the custom to inject the pickling or curing solution into hams, shoulders, and other thick portions of meat to hasten the process of curing. The committee was informed that sour hams were classed as such and sold at a reduced price. The committee took several samples of the pickle used in these needles, and an analysis by the Bureau of Chemistry showed that the pickle contained a trace of borax, probably from the salt, and large amounts of nitrates, but no sulphuric acid or sulphites.

16. They (condemned carcasses) are kept under the same roof on the same floor where food is being prepared for human consumption. Indeed, worse than this, the diseased carcasses are brought nearest to the windows, so that there may be a better light to examine them. But, on the other hand, such air as may gain admittance into the huge building from these windows passes round, over, and between these diseased carcasses before it can reach the moist meat that is being cut up and prepared at a short distance.

16. In the case of hog carcasses which have been condemned for various diseases, the final inspection is made on the hanging floor, usually near the windows, for the purpose of getting good light. This hanging floor is the room where the recently dressed carcasses are allowed to lose most of the animal heat before being placed in the coolers. No meat is cut up or prepared on the hanging floor. In all the abattoirs visited, with one exception, these condemned hogs are tanked directly from the hanging floor on the day of condemnation. In the case of condemned beef carcasses they are removed to the retention rooms, which are partitioned off from the coolers, sometimes by a solid partition, at other times by a slat partition, but always in such a manner that the air does not pass "round, over, and between these diseased carcasses" before it can reach healthy meat. No carcasses having putrefactive changes or unnatural odors are placed in these retention rooms. They are tanked at once.

17. When finally the carcass is taken to the destructor the opening of this tank—at least of the tank which I saw—is inside a large building in the floor, and round it many people were working. The place is dark, wet, and altogether in a most unsuitable condition for the handling of meat. Nevertheless, not only is human food prepared here, but diseased carcasses, condemned as unfit for human food, are dragged through the compartment. The lid of the destructor is removed within a few feet of meat that is to be eaten. The promiscuity of the two occupations of examination and destruction of diseased carcasses and the preparing and cutting up or the washing of carcasses that are not diseased is most disgusting and reprehensible.

17. In some of the establishments the offal and fertilizer tanks are not sufficiently isolated. The committee saw no condemned carcasses being dragged through any part of a plant.

[The Lancet, January 28, 1905.]

18. Then, there is a department where a considerable number of women pack tongues in tins. Just behind them these tins are soldered, and this operation produces a great heat. Also close at hand jets of steam are discharged into other tins so as to sterilize them. And yet not very far off there are cold-storage rooms.

18. This description fits one canning room, but is unfair as a generalization. The room mentioned is in bad condition, much worse than the writer in the Lancet states. In this room water is dripping on the heads of the female workers, who wear cloths on their heads to protect them from the drip. The air is surcharged with steam and solder fumes. Partitions and a power fan would do much to remedy the conditions in this

room. In other canning departments the committee found good light and ventilation; power fans to take care of steam, and conditions made as sanitary, pleasant, and comfortable for the workers as was possible.

19. A partition would protect some of the women workers from the steam, but no one seems to care, and even so simple and inexpensive a device has not been adopted. Again, there is a blue paint employed to color tins. Fine particles of this paint are blown about and have a distinctly irritating effect on the air passages, which predisposes them to more serious diseases.

19. In the larger canning departments the painting of cans is done with a machine, through which the cans pass, and the paint is sprayed on them. From one of these machines vapor was observed to rise; from the other machines no vapor was discernible.

20. * * * This (spread of the bacilli of tuberculosis is done by the boots of the persons going to and fro and by the pieces of meat which fall on the floor by the carcasses, notably of the big cattle, which are deliberately laid on the floor by the wheels of the trucks, etc.

20. It is conceded that if tubercle bacilli were present they could be spread by the boots of the workers, wheels of the trucks, etc., but the only place where the carcass is deliberately placed upon the floor is on the killing bed, before the skin is removed. Facilities were observed for handling big as well as small carcasses, and the inference that carcasses which are dressed are laid on the floor deliberately is incorrect.

21. As already explained, anything like a thorough disinfection of the premises is impossible and is never attempted.

21. The visits of the committee to the various abattoirs were unannounced and unexpected, but it was a common occurrence to note that workmen were engaged in cleaning the floors, benches, and various portions of the machinery. In some houses the killing floors were washed with equal parts of caustic soda and pine tar, followed by an application of hot, steaming water. In other houses caustic soda and hot, steaming water only were used, while in still other cases the odor of chlorid of lime was noticed in the cleaning mixture. In visiting cutting and trimming rooms it was frequently noted that the floors and benches were dry and clean and that salt had been sprinkled about for the purpose of keeping these rooms sweet and clean and of preventing any odors in case a crack or crevice contained blood or scrapings that were not reached at the time the parts were washed. The usual method of cleaning was to apply washing soda and hot, steaming water, after which the floors were dried with rubber squeegees. A jet of hot, steaming water had just been applied to the ferris-wheel scraper and accessories, sticking pens, and other portions of the killing floor of the house at the time of the committee's visit, and this observation was repeated at other times during the investigation. Nevertheless, this can not be considered as a thorough disinfection when the ceilings, rafters, etc., are not given similar treatment.

22. * * * The smallest scratch or cut (on the person of the worker) will result in blood poisoning if the wound is not at once treated with a strong antiseptic. Then there are the festering sores of the men who work in the ham-curing department and who are constantly plunging their hands and arms in brine.

22. Many employees were interviewed with reference to the healing of small wounds on their bodies, particularly on the arms and hands. They stated that blood poisoning was not feared nor was it prevalent among them. In fact they made light of the suggestion. Furthermore, the hands and arms of numerous employees who work in brine were noted, but no festering sores were seen in any case, but only the bleached, shrunken appearance of the skin, which is always associated with work in water.

23. It may also be noted that the rendering vats are most dangerously placed. The lids are on the level of one floor, and the vat or tank is on the floor below. * * * It is asserted that several persons have thus met with an awful death.

23. After careful inquiry, the committee was able to hear of only one workman who had fallen into a rendering vat. The body of this man was immediately recovered and buried. This accident occurred several years ago.

24. Nevertheless, it will scarcely be credited, a large portion of the stabling and cattle pens (in the Union Stock Yards) is on the bare earth. * * * Here and there, * * * not to prevent contamination, * * * but to secure a better roadway, a firmer foot-hold, and to reduce the mud nuisance, a sort of rough wood pavement was put in. This is made of the trunks of trees cut horizontally. These little round logs are placed side by side. This backwoodsman's expedient has now been replaced by the use of bricks, but neither bricks nor blocks prevent the contamination of the subsoil.

24. The Union Stock Yards, at Chicago, Ill., contains 500 acres, about 50 of which are either covered by buildings or used for the storage of manure, lumber, etc. This latter portion, commonly known as "the dump," is the only area which is not paved or covered with flooring. Of the remaining 450 acres, an area comprising a very few acres, which includes the pens that are scarcely ever in use, is floored with planking and

drained by box sewers. The remainder of the cattle pens, roadways, and alleys, comprising the vast area in daily use, is paved throughout with vitrified brick, having a low degree of water absorption. The moving of an office building permitted the committee to observe that the bricks adjacent to this structure were put down upon a substantial foundation. The drainage is good, and the pens are kept as clean as the character of their use would permit.

25. It is over the bare earth also that the railway cattle vans, laden with live stock, arrive and discharge their freight. * * * At Chicago the cattle step out on the bare earth, which they soil and contaminate.

25. The railway tracks and roadbed leading into the stock yards are similar to others throughout this country. The cattle are discharged from the cars on the wooden platforms and into the paved chute pens; then they are taken through overhead driveways to the different portions of the yards.

26. Pending their sale, the animals have no suitable stabling provided for them.

26. These yards are, as a rule, not covered, although the cattle are usually removed from them for slaughter or shipment during the day on which they are received.

[The Lancet, December 23, 1905.]

27. * * * Protests have been made against the fact that the United States meat inspectors have to examine for trichinæ all the hog's flesh that is exported from Chicago to Austria, Germany, Denmark, and France, but that the hog's flesh exported to Great Britain or consumed in the United States is not so examined and guaranteed.

27. It is plain that this microscopic inspection is chiefly a commercial matter, and that it was instituted for the purpose of regaining an export market for American pork products which had been excluded from certain European countries. Americans usually cook their pork before eating, and thereby render the trichinæ harmless. As a result the outbreaks of trichinosis in this country are very few and chiefly among foreigners. Thus, Dr. Ch. Wardell Stiles states that from the beginning of 1893 to February 7, 1898, there have been 40 or 50 cases of trichinosis reported for this country. (Practice of Medicine, William Osler, 1898, p. 356.) Furthermore, funds are not available to extend this microscopic examination, for to carry out such an inspection of the carcasses of all hogs slaughtered in official abattoirs would require an appropriation of about \$4,110,000 for this purpose alone.

28. It would seem as if the two city inspectors of meat, in their newly awakened zeal, had shown more perspicacity than the Government inspectors, who are appointed by the central authorities at Washington, and whose special mission it is to protect those foreign and European countries which have legislated against the importation of trichinæ from Chicago. In any case, the report says, speaking of the condemned meat: "Among these animals were six cattle that had been passed by the Government inspectors. Two cattle were found last week by the department inspectors that had been passed by the Government inspectors after the evidences of tuberculosis had been trimmed out. The city inspectors destroyed these cattle. The Government inspectors refused to allow the city meat inspectors to remove glands and other organs suspected of being diseased for the purpose of microscopic examination by the laboratory bacteriologists."

28. The visit of the committee to Chicago developed the fact that the department of health of the city of Chicago had no written or printed regulations governing the inspection of meat. In one case, where 10 carcasses which had been passed by Federal inspectors and then condemned by the city were reexamined by Doctors Mohler and Steddom and other veterinarians—it developed that the condemnation by the city was improper, and the head of the city inspection force stated that these condemnations had been made by a city inspector who at the time had his discharge in his pocket and was "anxious to get even."

It is true that the relations heretofore subsisting between the city inspectors and the Federal inspectors at Chicago have not been as close as is desirable. This defect has now been remedied, however, and the regulations of the Bureau of Animal Industry, governing the inspection of meat, have been adopted by the city of Chicago.

29. It (slaughtering) is grossly inhuman, because no effort is made to mitigate the apprehension and torture of the animal.

29. The method of killing one steer with the percussion mask, recommended by this writer, requires more time than would be consumed in killing eight similar animals with a sledge hammer. And the inhumanity that has been charged against the latter method, owing to the very infrequent necessity of striking more than one blow, would be more than offset by the fright and struggles of our range cattle caused by fastening the mask to their heads. It would be a diverting spectacle to witness the effort to affix the mask to the head of a wild, long-horn Texas steer, but the fear and apprehension of such an animal would be greatly enhanced.

Articles which will appear in The World's Work for May, and which have been submitted in confidence to the Secretary of Agriculture.

A PICTURE OF MEAT INSPECTION.

[By W. K. Jacques, M. D., formerly director of the Chicago municipal laboratory, city bacteriologist, and head of the meat inspection at the Chicago stock yards.]

30. I found that the Federal inspectors were condemning considerable meat and sending it to the rendering tanks, and when I confronted them with my interpretation of the law they admitted that they could not legally send the meat to the tanks, but that it was done under the threat that if it were not permitted Government inspection would be withdrawn from the objecting packers.

30. This is true. Under the present law the Federal inspector has no authority to destroy meat which, upon inspection, is found to be unwholesome and unfit for food. His legal duty is confined to marking for identification the carcasses which have passed the inspection as fit for food. In the report of the committee certain legislation is suggested which, if secured, will overcome this defect in the law.

31. Government inspectors are employed in all packing houses that export beef, and usually there is but one inspector on duty at the killing beds of each packing house. The accuracy and thoroughness of the work of these inspectors can be judged when it is estimated that from 1,600 to 2,200 cattle are often killed under the eye of a single inspector in a day of from eight to ten hours.

31. In the larger abattoirs two Federal inspectors are continually engaged on each hog-killing floor, while one, and frequently two inspectors are on each beef-killing floor. These inspectors are relieved by others every two or three hours. Owing to the system of slaughtering in vogue and the inspector's adaptability to the work, he is enabled to examine each carcass carefully, although a large number of carcasses pass before him during a day. As many as sixteen Federal employees are detailed to a single establishment.

32. Hanging in the room, in full sight, unguarded and open to the public, were two sides of beef having on them the slashes of the State inspector and the Government tag of condemnation, but the meat was not under lock and seal, as required by Government regulations, nor was there anyone to prevent its being carried off.

32. When a carcass is found to be diseased, a condemnation tag is attached thereto. Such a carcass, under the regulations of the Department of Agriculture, is not always placed in the retaining room for condemned carcasses, but is tanked from the hanging floor, under the supervision of a Federal inspector, after the killing for the day has ceased. If such a carcass were spirited away, inquiry would be made at once.

33. One other incident would go to show that sausage advertised as "Government inspected" is a rather uncertain article. Immediately following the passing of meat by the Government inspector the beef trimmers cut off all unsightly portions, bruised or injured places, and large glands or abscesses. I asked an inspector what was done with these trimmings. "Sausage," was his laconic reply. Can an inspector guarantee all the component parts of sausage when he examines the finished product?

33. Bruised portions and abscesses are tanked for fertilizer. The inspector does not attempt to examine sausage or similar products after they are finished. Federal inspection is made at the time the animals are slaughtered and dressed.

34. With two regular and some temporary inspectors, in less than five months more than \$300,000 worth of diseased and rotten meat, much of which had already been passed by Government inspectors, was destroyed, a striking contrast to the small amount of the year before.

34. This statement refers to municipal inspection. The amount of meat destroyed includes that condemned and tanked for fertilizer by Federal inspectors. As already explained, many of the condemnations made by the city were dictated by the personal caprice of the inspector making them. Again, under existing law and with the present inadequate number of inspectors, the Department confines its inspection to an examination of the carcass at time of slaughter. Moreover, the city inspectors have condemned quantities of meat which at the time they found it was old and slimy, but which at the time of inspection by the Federal inspector was in good condition.

35. During my experience I found there was a large number of animals coming into the stock yards with actinomycosis, a disease known as "lumpy jaw." The bacteria of this disease find the caries of the teeth a suitable place to invade the tissues and cause a lump to form on the jaw. It is mildly contagious, both to men and to animals. * * * Formerly the packers bought all the cattle sent in, but the loss from diseased animals proved too large. * * * The inspection of this meat is very lax, though it passes Federal, State, and city inspectors. The rules of all these permit the passing of this meat, if the disease is not far advanced, or if it is encysted—that is, inclosed in a membranous sac.

35. Cattle having actinomycosis are inspected ante-mortem by both the Federal and the State inspectors. Action thereon is taken by the State inspectors exclusively. How-

ever, these cattle are all subjected to a strict post-mortem inspection by Federal inspectors, and the regulations under which the inspector passes upon the carcasses are based upon the highest scientific authorities on meat inspection.

36. It is impossible to say, under present conditions, how much diseased meat passes through packing houses. There is but one way in which anything like an accurate estimate could be made, and that is to have each animal, as it is killed, pass into the hands of a competent expert, with good light and every facility to make a complete examination. * * * At present only such as are intended for export are required to pass such an examination. Foreign governments have obliged us to require a rigid examination of all meats exported. It can be seen by these facts that the present system of meat inspection results in a grading according to the intelligence of the intended customer. The foreigner gets the very best, for he demands it, and has experts to see that he gets it. The interstate trade gets the next grade. Beef trimmers remove every visible mark of disease, and the State laboratories have not the resources to examine dressed meat. What is left goes into the Chicago market.

36. In all abattoirs having Federal inspection the entire meat product is inspected by the Government inspectors, whether it is intended for export, interstate traffic, or consumption within the State. In fact, there is no way for the inspector to determine whether the carcass to be inspected is for England, Boston, or Chicago, and the regulations governing the post-mortem inspection apply with equal force to all meats intended for any one of these points. In addition to the ordinary post-mortem examination, hog carcasses, the meat of which is intended for Germany, France, Austria, Italy, and Denmark, are subjected to a microscopic inspection for trichinæ. Pork exported to other countries not requiring this inspection is carefully examined by competent experts with every facility for making a good examination, the same as pork intended for shipment to another point in the United States or for local consumption.

37. The Federal inspector comes to his task at the request of the owner, whose animals he is to inspect and with whom he comes in daily contact. The packer is a good fellow, a bright, sharp, generous, business man. * * * He is a millionaire many times over. Around him, at his command, are a thousand conditions which may influence the inspector. To say that he will not be influenced by these conditions is to say that he is not human.

37. The meat inspectors of the Department are all secured through examinations held by the Civil Service Commission. Before a man is eligible to take this examination he must show that he is of good moral character, and that he has received a degree of doctor of veterinary medicine from a reputable college.

38. To make the action of the inspector more uncertain, there is, as I have said, no well-defined standard of condemnation. While Government instructions are clear and definite concerning export meat, the inspector is permitted to use his judgment about that intended for domestic use.

38. As previously stated, excepting the microscopic inspection of pork for the few European countries demanding this examination for trichinæ, the regulations of this Department apply with equal force to meat intended for export, as well as for domestic use. Therefore the acknowledgment that the instructions are clear and definite concerning export meat implies the same clearness and definiteness for meat inspected for domestic use at the same time, for, as a matter of fact, the inspector has no knowledge of which carcasses are for export and which are not. The Bureau regulations, which were incorporated in Bureau of Animal Industry Order No. 125 and are intended to control the disposition of meat from inspected carcasses, are clearly defined, thorough, and most rigid. Backed by them the inspector may unflinchingly perform the duties of his office. They are based on the work of the highest recognized authorities upon the various diseases in question and were promulgated only after due consideration was given to the results and opinions of these scientists in Europe, as well as in this country.

39. Government inspection is only at the packer's request. State inspection is purely illegal in Chicago, for the power of condemnation and destruction was given to Chicago in its charter, and the State legislature can not delegate this function to a live-stock commission. But the State legislature has been only too glad to assist the packer by creating a live-stock commission. This seizes suspected and diseased animals, quarantines and slaughters them, and gives the packer the opportunity of buying meat (diseased and unwholesome) with the stamp of the inspector on it at half price.

39. There is some force in the contention that effective meat inspection within the city limits of Chicago by State authorities is not within the law. It is true that by its charter from the State the city of Chicago is given the power of condemnation and destruction. The quarantine power of the State is over the live animal, and not the carcass. As previously stated, the carcasses of all animals condemned by State inspectors on ante-mortem inspection are subjected to a strict post-mortem inspection by Federal inspectors.

40. Then, remember that bacteriologists say that the tubercular germ is one of the most resistant things in nature. Its hard, horny body resists extremes in temperature. The rules of the Government require that lard rendered from tubercular hogs shall be

boiled for four hours at a temperature of 105° C. Can it be possible, then, that roast beef and 2-inch steaks from tubercular cattle are safe food in a rare state?

40. No statement of any recognized bacteriologist can be found which claims the tubercular bacillus is one of the most resistant things in nature and possesses a hard, horny body. Sternberg found by numerous experiments that the temperature which is sufficient to kill this organism lies between 50° and 66° C. Yersin failed to obtain any growth from bacilli which had been heated to 70° C. for ten minutes. McFadyean and Hewlett found that tubercle bacilli were rendered innocuous by a momentary heating to 67° or 68° C. Experiments by the Royal Commission on Tuberculosis showed that twelve minutes at 70° C. rendered virulent tubercular milk inert. Yersin found that the tubercular bacillus was killed in thirty seconds by 5 per cent carbolic acid, in one minute by 1 per cent, by absolute alcohol in five minutes, and in ten minutes by 1-1,000 mercuric chlorid.

In the light of these experiments it would appear that four hours at 105° C. would most certainly kill tubercle bacilli if they should, perchance, be in the carcass placed in the lard tanks, although it must not be forgotten that tubercular viscera are condemned for offal, that tubercular hogs with the body lymph glands involved are also tanked for offal, and where slightly affected hogs are placed in the lard tank, the throat glands, if tubercular, are previously removed.

THE FAILURE OF GOVERNMENT INSPECTION—TAINTED MEATS CERTIFIED BY THE GOVERNMENT AS PURE—THE FARCE OF INSPECTION—A LOOSELY CONSTRUCTED LAW THAT GIVES THE INSPECTORS DISCRETION—WHY THEY BOW TO THE PACKERS—THE REMEDY.

[By Thomas H. McKee, a lawyer of New York, who was sent to Chicago by The World's Work to examine the working of the inspection made in the packing houses there.]

41. Buy a can of corned beef and you read upon its label that it has been "U. S. Government Inspected." * * * You reasonably assume that the Government has seen to it that the meat came from a healthy animal and had been prepared in a clean and wholesome manner. I am able, however, to state upon knowledge that the Government does not know what is in that can.

41. The supervision of canning factories by Federal inspectors under existing law and with the inadequate number of inspectors is necessarily confined to an attempt to see that the meat of no animal other than those which have been killed under Federal inspection and passed as fit for food come into such factories. The notice of inspection placed upon the cans varies somewhat, but the general form is, "The contents of this can have been inspected under act of Congress," etc., and the can is marked "U. S. Inspected." The fact is that the carcass of which the meat in the can is a part was inspected and passed at time of slaughter. The committee in its report recommended legislation giving the Department authority to control all the operations of these factories and an appropriation sufficiently large to pay men to do the work.

42. The law of the city of Chicago requires that these animals (rejected on ante-mortem examination) be sold at auction and the proceeds remitted to the owners. This means that harpies engaged in the diseased-meat industry buy these culls, slaughter them, and sell the meat.

The inspectors in the yards make their examination of particular lots of stock at the time the packer's buyers purchase those lots. Animals rejected by the inspectors are also rejected by the buyers. The packer has the benefit of a Government-paid veterinarian in sorting the stock he buys. This inspection is said to be quite strict. The packers get the advantage of it.

42. It is true that ante-mortem rejects are often purchased by individuals and establishments and slaughtered where no Federal inspection is had. Under existing law this is an evil which can not be reached by this Department. The ante-mortem inspection is fair to all concerned. If an animal is visibly diseased in such manner as to render probable its condemnation on post-mortem inspection, it is so tagged, regardless of where the loss falls.

43. After a steer has been killed and placed in the cooling room the carcass and its parts are never again seen by an inspector. Many weeks later a case of sealed cans, each containing something, is presented to an inspector to receive the Government label. The packer tells the inspector the cans contain meat, and the label is put on. During the interim that meat has taken a dreary journey. It has been cut up and stored in dark, rat-infested rooms, has been soaked for weeks in liquid pickle, trundled through murky passages, pitch-forked by laborers from vessel to vehicle and back again, and finally cooked in open vats in rooms low, hot, greasy, and, except for the flare of torches, dark as a mine.

43. The reference to Government labels evidently means the Government inspection stamps, which show that the product in the can is part of a carcass which was inspected at the time of slaughter by Federal inspectors. As previously explained, under existing law and with an inadequate number of inspectors no effort is made to supervise the processes in the canning factories other than to prevent the entrance of noninspected meats.

44. The Government inspectors, officially, know nothing about the processes through which the meat has passed after leaving the cooling room. Ceilings, walls, and pillars may bear the accumulated filth of years; cooking vessels and utensils may be germ laden and poisonous; the personal cleanliness of the workmen may be wholly forgotten; yet all these conditions, so vitally affecting the purity of the product, the Government ignores. The inspector's stamp does not guarantee sanitation, cleanliness, nor absence of adulteration, and in vouching for the purity of products prepared as packing-house products are the Government makes itself a party to a most reprehensible deception.

44. It is true that the Federal inspectors do not supervise the processes in the canning rooms, and for reasons previously given—that is, the lack of a sufficient number of inspectors—the sanitary conditions of the abattoirs have not been supervised, and unless the Department is to be given a law under which it can supervise and control the conduct of these establishments, and an appropriation sufficiently large to pay men to do the work, the committee feels that the trade labels and inspection legends should be so worded as to show the fact; that is, that the meat in the can came from an animal which at the time of slaughter was inspected and passed as fit for food.

45. Rules of the Bureau of Animal Industry covering inspection of the animals after they have been slaughtered recite forty-five distinct conditions and specify the disposition which shall be made of any diseased meat found. About one half of these rules require destruction of infected carcasses; the other half permits the inspector to pass the diseased meats to be sold to the public either as fresh, packed, or cooked meats, or as by-products, such as lard, sausage, and other articles of food. The mischief in these rules is:

(1) That the packers are permitted to sell diseased meat without warning to the consumer; and

(2) That in the clause which precedes and qualifies all the other rules this appears: "It is to be understood, however, that owing to the fact that it is impracticable to formulate rules covering every case and to designate at just what stage a process becomes loathsome or a disease becomes noxious, the final disposition of all those not specifically covered by these rules will be left to the judgment of the inspector in charge." The rules are very general, and with this wide-open qualification the inspector's responsibility is amazingly slight.

45. As indicated in the above paragraphs, the majority of the Department regulations concerning the disposition of meats require the destruction of the carcasses if found affected with the stated diseases. Of the remainder, the vast majority of condemnations are for actinomycosis, tuberculosis, and hog cholera. In order to be as specific as practicable, a number of clauses were included describing fully the action desired in stipulated cases. For actinomycosis, 7 variations were given; for tuberculosis, 13, and for hog cholera, 5. Now, if the author were slightly familiar with pathology he would understand that numerous combinations of lesions may occur which would require a volume to describe if every possible combination were depicted. A working basis has been supplied, the action desired by the Chief of the Bureau has been outlined, and now it remains for the inspector in charge of the work to interpret the individual case according to the regulations. A full report of the lesions is made to Washington on a blank, and if his opinion is incorrect he is notified accordingly and instructed further as a guide to action in future cases.

It should also be remembered that, although the inspector is not paid an excessive salary, he is a professional man, with a degree as doctor of veterinary medicine from a reputable college, and is supposedly possessed of some judgment, which he should be allowed to use in making his diagnoses.

The statement that the packers are permitted to sell meat without warning to the consumer will be treated in a succeeding paragraph.

46. * * * On the occasion of a visit I made to the packing houses, the hogs from the killing floor * * * were moving toward the doors of the cooling room. I noticed that occasionally a solitary hog was cut out of the line and pushed along an overhead track to the middle of the room where several others hung. There happened to be six of these hanging together when my party arrived. Two of them were as red as if smeared with paint, and scabbed on the legs and snouts.

"These hogs had cholera," the inspector said, "and the next three are tubercular. See how skinny they are, and they have these queer spots inside of them."

The remaining carcass had an ugly ulcer in its side. Around a block near by several men were chopping up these diseased hogs. The pieces were thrown into a box truck, which, when full, was trundled into another room alongside the huge iron cylinder.

* * * The chunks of diseased meat were then thrown into the tank in the inspector's presence.

"What will be the product of this tank?" I anxiously inquired.

"Fertilizer and lard," the inspector replied.

46. The Department regulations stipulate that diseased carcasses shall be either condemned for offal or passed for food, excepting in those cases of hogs showing mild lesions of hog cholera or tuberculosis, when they may be rendered into lard, provided they are cooked by steam for four hours at 220° F.; the tubercular lesions having first been removed and condemned. Not the slightest objection can be raised against this procedure from a hygienic standpoint, and in justification of this action may be mentioned the resolutions adopted at the Congrès pour l'Etude de la Tuberculose chez l'Homme

et chez les Animaux de 1893 and 1898; and the works of Ostertag, the highest authority on meat inspection in Europe; Edelmann, John, Stubbe, Bollinger, and many other prominent investigators, whose opinions on this subject are decidedly more liberal than the regulations of the Department of Agriculture.

It has been acknowledged in all countries having a rigid system of meat inspection that some provision should be made for fat and half-fat carcasses showing lesions which are too slight to cause condemnation for offal and yet are of such a character that one would not care to pass the carcasses for food. It is in these cases that the regulation permitting them to be rendered into lard operates most usefully and saves for both the producer and consumer that which would be entirely lost without it, and at the same time conforms fully to all the requirements of hygienic science.

47. The law also provides for microscopic examination of pork. The rules say: "A microscopic examination for trichinæ shall be made of all swine products exported to countries requiring such examination. But no microscopic examination will be made of hogs slaughtered for interstate trade."

There is no microscopic examination required and none in practice, except of pork, and then only of pork from hogs intended for export. When these parasites are found present the carcass is rejected. "And destroyed?" I hear you ask. Not a bit of it. That infected carcass is sent to the domestic pork department, cut up into hams and bacon, and sold to us branded "U. S. Government Inspected."

47. This statement is grossly misleading, and is calculated to give the impression that hog carcasses in which living trichinæ are found are sent out without restriction to be eaten by the people of this country. In case living trichinæ or nondisintegrated dead trichinæ are found in the carcass, the sample is marked "C," and as soon as this report is received by the employee whose duty it is to mark rejected and condemned carcasses and to supervise their removal and disposition he marks the carcass with a condemnation tag and brands the letter "C" upon each ham, shoulder, and side. All these class "C" carcasses are taken from the cooling room and rendered into lard at a temperature not lower than 220° F., or made into cooked-meat products, if the temperature is maintained at the boiling point a sufficient time to cook thoroughly the interior of the pieces. In case it is desired to have the meat of a carcass cured before being cooked, it is marked with twine and seals for identification. Those carcasses in which are found disintegrated or calcified trichinæ cysts, or any substance which causes the least suspicion owing to similarity to the above, are marked "B," and the carcasses represented by these preparations are branded with the letter "B" upon each shoulder, side, and ham of each carcass. The meat of the "B" carcasses is withheld from shipment to those countries that require microscopic inspection, although free to be used in other trade. When the microscopist has found no trichinæ, trichina-like cysts, or other similar bodies, the preparations are marked "A," and the carcasses represented are used for filling orders from those countries demanding trichina-free pork.

48. The present law is both inadequate and loosely enforced. The inspector * * * said: "It is more or less in my discretion; the Department gives us rules, but in the end we have to use our own judgment. When I think a hog is too bad to be used for lard I order it into the grease tank." The use of general terms in defining the duties of an inspector is wrong in theory and pernicious in practice. If the inspector holds his position above and independent of the packer, the latter is at his mercy. On the other hand, if the inspector's tenure of office is to any extent controlled by the packer, which I shall show to be the fact, the inspector is reduced to servitude. (Mr. McKee here details a conversation had with the former inspector in charge at Chicago, where the inspector in charge told Mr. McKee that if a packer refused to permit carcasses to be destroyed the inspection would be withdrawn. Mr. McKee draws the inference from this statement that the inspector is afraid to condemn meats for fear the packer will decline further inspection by the Government and thus throw the inspector out of a job.)

48. For reasons hereinbefore explained the inspector is not robbed of the exercise of his judgment in making diagnoses, but he is required to follow rules and regulations of the Bureau as they apply to each particular case he has under consideration. As previously explained, each inspector is obtained through examinations held by the Civil Service Commission, and notwithstanding the utmost efforts of the Commission a sufficient number of properly qualified inspectors can not be maintained on the register of the Commission. The inference that the inspector is afraid of losing his job because the packer will decline further inspection is farfetched and without foundation in fact, the demand for properly qualified inspectors being in excess of the supply.

49. The net result of the present system of inspection under the law can be boiled down as follows:

(1) The ante-mortem inspection provides the packer with an expensive force of veterinarians, enabling him to cull out of the herds stock bearing open blemishes, throwing the loss on the producer but not diminishing the amount of defective carcasses which ultimately reach the market.

(2) The post-mortem examination provides the packer with an expensive corps of inspectors for the purpose of selecting hogs proper for sale in the German market; Government-paid employees examine each carcass, noting blemishes which unfit it for

sale over the block; defective carcasses are classified by the Government inspectors and devoted to food purposes unless so seriously damaged that the use of the product by the consumer would be dangerous, and so lead to detection.

49. (1) An ante-mortem inspection of the animals is required by law. This inspection is solely for the purpose of detecting, so far as possible, all animals which would likely be condemned as unfit for food upon post-mortem examination. By this inspection live animals are tagged when showing certain conditions which would render their flesh unfit for food. Some of these conditions could not be discovered after the animals are slaughtered.

(2) It is the opinion of the committee that the cost of the microscopic inspection of pork for export should be defrayed by the trade which it benefits. The animus of this writer is clearly shown by his statement, which gives no heed to the thousands upon thousands of diseased animals which are condemned and destroyed.

50. The situation is exactly what it would be without Government inspection, except that with private inspection the packer, instead of the Government, would pay the bills. The responsible packer can not afford to put upon the market meat virulently diseased. In this there is a clearly defined legal liability for results. Government inspection, however, now permits the packer to sell under sanction of law questionable products as first class. The rules require meat to be classified into either first-class food or offal, and this function is vested in an inspector who is more or less under the thumb of the packer. The latter, therefore, gets all the benefit of Government inspection with few of the burdens.

The whole situation suggests that Federal inspection is nothing more than a shrewd advertising scheme suggested to the packers several years ago, when several European countries forbade the exportation to them of trichina-infected pork. The flaunting of Government inspection in our face is equivalent to "See how Uncle Sam makes us be good. It is awfully hard on us, but you, the public, get the benefit." I doubt if the arrival of the corps of United States inspectors in Packingtown has, in any essential, ruffled the even tenor of the packers' ways.

50. As stated in the comment next preceding, no credit is given in the above statement for many thousands of animals condemned and destroyed by Federal inspectors, and if the writer believes that the work of the corps of United States inspectors in Chicago has not "in any essential ruffled the even tenor of the packers' ways," he gives credit to those packers for being willing to destroy these many thousand carcasses without the compulsion of Federal inspection, and is certainly more trusting than is the committee. The statement that Government inspection permits the sale of questionable products as first class is not supported by an examination of the regulations of the Department or by an investigation of the practice at Chicago.

51. We are told that in scientific Germany not all diseased meat is destroyed. That is true; but such meat is sold as diseased and at a much lower price. It is not mingled with the best meat and all sold together under the same name at the same price. Let us adopt the German system in its entirety, if at all.

51. To the Inspector in Germany, Italy, Belgium, and France it is not merely a question of yes or no, but with their Freibank—a place where sterilized diseased meat and inferior meats are sold as such—and the permission to sell certain infected meat after cooking, or raw meat of a low nutritious value, the responsibility is divided and materially lessened. It is quite erroneous to imagine that because of several possible actions of the German inspector the carcass passed as fit for food is in all cases of a normal animal. Perusal of the official regulations concerning the method of procedure with the meat of tuberculous animals in the Kingdoms of Prussia, Bavaria, Saxony, the Grand Duchy of Hesse and Mecklenburg-Schwerin will show that the carcasses of animals containing lesions of tuberculosis, not generalized or extensive, are freely admitted to the market without restriction, just as if no tubercular alteration had existed. This is further brought out by the result of this provision in the Kingdom of Saxony in the utilization of the meat of tubercular animals. In 1899, 1.41 per cent of tuberculous cattle was destroyed, 5.15 per cent sold on the Freibank, and 93.43 per cent freely admitted to the market; while 0.83 per cent of the tuberculous hogs was destroyed, 26.36 per cent sold on the Freibank, and 73.01 per cent freely admitted to the market, mingled with the best meat, and all sold together, under the same name, at the same price. Surely this does not indicate that all diseased animals in Germany are either sold as such or condemned, and that all meat freely admitted to the market is from normal animals.

What is said here of the treatment of tubercular carcasses may be applied also to meat showing other diseased conditions. For instance, in actinomycosis, where isolated foci occur in the tongue, it is recommended by certain German authorities to remove the diseased parts and release the remainder of the tongue for food; while according to the Department regulations the entire head must be tanked for offal. In fact, the latter regulations are much more stringent than those of the Germans, and meat which is made into fertilizer in conformity with them may be passed for food without restrictions in Germany.

THE HEALTHFULNESS OF PACKINGTOWN.

[By Caroline Hedger, M. D., a physician who visits and practices among the people in Packingtown—the workers in the packing houses and their families.]

52. From the ceilings of the killing rooms and corridors to the rag that a girl wipes a can with before capping it there is dirt.

52. This statement is true of certain rooms of certain establishments, but is absolutely unfair as a generalization.

53. The air in some of the departments, especially in the canning department, is bad—sometimes so steamy that it is impossible to see through it, providing moisture to keep tuberculosis germs alive.

53. As has been previously explained in these comments, the criticism in the above paragraph of the condition of the air in some of the departments is correct, but as a generalization it is grossly unfair.

54. In the painting rooms, where girls paint the cans, the smell of turpentine is very strong, and the girls inhale so much paint that their sputum is blue.

54. It is true that the odor of turpentine is very strong in the painting rooms.

55. The toilet facilities in the houses are, I am told, scanty, and the dressing rooms for women very crowded.

55. In contradistinction to the condition of the water-closets provided for the use of the male workers it was observed that in the majority of the establishments the toilet and dressing rooms for women were found to be adequate and well kept.

QUOTATIONS FROM "THE JUNGLE."

[By Upton Sinclair. A novel. 1906.]

56. This Government inspector did not have the manner of a man who was worked to death. He was apparently not haunted by the fear that a hog might get by him before he had finished his testing. If you were a sociable person he was quite willing to enter into conversation with you and to explain to you the deadly nature of ptomaines, which are found in tubercular pork. * * * This inspector wore a blue uniform, with brass buttons, and he gave an atmosphere of authority to the scene and, as it were, put the stamp of official approval upon the things which were done. (Pp. 42-43.)

56. The Government inspectors at these houses do not wear blue uniforms with brass buttons, and it is impossible to distinguish them by their dress. It is, therefore, not unlikely that the person referred to in the above statement was not a Federal inspector, but a house policeman or fireman, who are the only persons employed about a packing house who dress in blue uniforms with brass buttons.

57. Then this party went across the street where they were killing the beef—where every hour they turned four or five hundred cattle into meat. (P. 44.) * * * And the boss would start up a conversation with the Government inspector and the two would stroll away. So in a trice the carcass of the cow would be cleaned out and the entrails would have vanished. It was Jurgis's task to slide them into the trap, calves and all, and on the floor below they took out these slunk calves and butchered them for meat and used even the skins of them. (P. 74.)

57. In the larger abattoirs in Chicago there are from 16 to 28 beds, or divisions, of the killing floor. A force of workmen in one of these abattoirs may kill and dress about seven runs of cattle in an hour, which means an average of from 110 to 200 beef carcasses per hour, but never from 400 to 500 such carcasses. The person alleged to have been the Federal inspector engaged in conversation with the "boss," who strolled away with him, may have been a man in uniform, while the inspector, who can not be easily distinguished from the workmen, was attending to his duties along with the gutter who removes the viscera from the carcasses.

It is not unusual for unborn calves to be placed in a chute and thus carried to the floor below, where their skins are removed. Such skins are used for leather. The carcasses of such calves are tanked for offal.

58. It was late, almost dark, and the Government inspectors had all gone, and there was only a dozen or two of men on the floor. That day they had killed about 4,000 cattle, and these cattle had come in freight trains from far States, and some of them had got hurt. There were some with broken legs and some with gored sides. There were some that had died from what cause no one could say, and they were all to be disposed of here in darkness and silence, "downers," the men called them, and in the packing house had a special elevator upon which they were raised to the killing beds, where the gang proceeded to handle them with an air of businesslike nonchalance which said plainer than any words that it was a pure matter of everyday routine. It took a couple of hours to get them out of the way, and in the end Jurgis saw them going to the chilling rooms with the rest of the meat, being carefully scattered here and there, so that they could not be identified. (P. 74.)

58. When necessary, on account of injuries or other extraordinary causes, to kill animals during the night or at times other than the established hours for slaughter, the

regulations provide that such animals may be slaughtered, provided the carcasses (with thoracic viscera attached and all other viscera identifiable) are held for inspection and are duly identified to the inspector by an employee of the abattoir; it is further provided that an official of the abattoir company shall furnish promptly to the inspector a signed statement showing the whole number of each kind of animal so slaughtered.

59. And then there was the condemned-meat industry, with its endless horrors. The people of Chicago saw the Government inspectors in Packingtown, and they all took that to mean that they were protected from diseased meat. They did not understand that these 163 inspectors had been appointed at the request of the packers, and that they were paid by the United States Government to certify that all the diseased meat was kept in the State. (P. 112-113.)

59. This statement is intentionally misleading and false from beginning to end. The Federal inspectors, as has been previously explained by the committee, inspect in precisely the same manner, with the exception of the microscopic inspection of certain export pork, and under the same regulations, all carcasses which are killed in an establishment, regardless of whether the meat is to be used locally, interstate, or for export. The meat sold to the people of Chicago which comes from establishments having Federal inspection receives precisely the same careful examination given to meat which is exported to Europe.

60. There was said to be \$2,000 a week hush money from the tubercular steers alone, and as much again from the hogs which had died of cholera on the trains, and which you might see any day being loaded into box cars and hauled away to a place called Globe, in Indiana, where they make a fancy grade of lard. (P. 113-114.)

60. The committee was unable to find any evidence of collusion or bribery among the Federal inspectors. To carry out such a scheme would require crooked work by a considerable number of Federal employees on account of the method of inspection by which two or more inspectors pass independently upon the same carcass, and on account of the system of changing inspectors from one establishment to another.

The rendering plant at Globe, Ind., above referred to, is known as the National Rendering Company, with office in the Exchange Building, Union Stock Yards, Chicago, Ill. The building is a two-story frame structure with no cellar and is much the same as all rendering establishments. Evidently considerable care is exercised by the management to keep the place as clean as possible. The plant is equipped with boilers, an engine, thirteen tanks, 12 feet by 6 feet; presses; vats in which oils, tallow, and grease are drawn off; also roller for drying tannage. No commercial fertilizer is made at this plant, but the dried tannage is sold to other factories. The various products of this plant are white grease, B white grease, brown grease, tallow, and horse oil. These various products are made from the cattle, sheep, and hogs that die in the Union Stock Yards, also those that die in cars en route to market. In warm weather these carcasses are delivered to the plant in the afternoon of the day on which they arrive, and in cold weather the morning after. A great many dead horses and dogs from the city are also sent to this plant. During the year 1905 the following dead animals were handled:

Hogs	25,486
Cattle	1,214
Sheep	4,504
Horses	9,067

There are no facilities in this plant for the manufacture of oleo oil or lard. All of the tierces in stock in the storage house were labeled white grease, tallow, etc. The tierces are all old ones and evidently not well cleaned. No shop tallow or fat are received here. The * * * Soap Company, Buffalo, N. Y., takes 75 per cent of the output during the summer. * * * Jeffersonville, Ind., and the * * * Soap Company, Cincinnati, Ohio, also purchase soap material here. A good many sales are also made through brokers. There is nothing about the place to indicate that it is other than what it is supposed to be. For years it has been a well-known fact that animals that die in the stock yards or are received dead on the cars are disposed of in this manner.

61. There were cattle which had been fed on "whisky malt," the refuse of the breweries, and had become what the men call "steerly," which means covered with boils. (P. 114.)

61. Cattle fed on malt, the refuse of breweries, sometimes have abscesses under the skin, due to the presence of dead grubs or "warbles." When these lesions assume a general pyemic character, the carcass is condemned and tanked.

62. * * * In some of which there were open vats near the level of the floor, their peculiar trouble was that they (men) fell into the vats; and when they were fished out there was never enough of them left to be worth exhibiting; sometimes they would be overlooked for days, till all but the bones of them had gone out to the world as * * * pure leaf lard. (P. 117.)

When, for instance, a man had fallen into one of the rendering tanks and had been made into pure leaf lard and peerless fertilizer, there was no use in letting the fact out and making his family unhappy. (P. 143.)

62. As has been previously stated by the committee, after careful inquiry, only one instance was reported of a man falling into a vat with fatal results. This happened several years ago, and the body was recovered and buried. In view of the fact that the committee could discover but one occurrence of this kind, the atrocious exaggeration of the author's statement is apparent.

63. * * * for there was never any washing of the walls and rafters and pillars, and they were caked with the filth of a lifetime. (P. 120.)

63. The committee did not find any evidence that the walls and rafters had been washed recently, but in many of the establishments the walls were clean and freshly painted, and the pillars or posts in the various rooms were in many cases clean and whitewashed. To some of the killing rooms the description of the author may be applied without exaggeration. It is apparent that in his anxiety to be as sensational and "yellow" as possible the author has not only in this statement, but all through his book, selected the worst possible condition which could be found in any establishment as typical of the general conditions existing in the Chicago abattoirs, and has willfully closed his eyes to establishments where excellent conditions prevail.

64. And now he died. Perhaps it was the smoked sausage he had eaten that morning, which may have been made out of some of the tubercular pork that was condemned as unfit for export. At any rate, an hour after eating it the child had begun to cry with pain, in another hour he was rolling about the floor in convulsions. (P. 150.)

64. The utter absurdity of this statement and the ignorance of the author is indicated by the fact that in the most rapidly fatal form of consumption known, the shortest time given by Osler for death to occur is in the second or third week following the first appearance of the symptoms. (Practice of Medicine, 1898, p. 291.) Furthermore, the symptoms given are not at all characteristic of tuberculosis.

65. In the pickling of hams they had an ingenious apparatus by which they saved time and increased the capacity of the plant—a machine consisting of a hollow needle attached to a pump. By plunging this needle into the meat and working with his feet, a man could fill the ham with pickle in a few seconds. (P. 160.)

65. This pickle, which is injected intramuscularly to hasten the curing process, has been hereinbefore described.

66. There would be meat stored in great piles in rooms, and the water from leaky roofs would drip over it, and thousands of rats would race about on it. It was too dark in these storage places to see well, but a man could run his hand over these piles of meat and sweep off handfuls of the dried dung of rats. These rats were nuisances, and the packers would put poisoned bread out for them. They would die, and then rats, bread, and meat would go into the hoppers together. This is no fairy story and no joke. The meat would be shoveled into carts, and the man who did the shovelling would not trouble to lift out a rat even when he saw one. There were things that went into the sausage in comparison with which a poisoned rat was a tid-bit. (Pp. 161-162.)

66. The committee observed meat piled upon the floor in many places, and in some cases a small amount of water, due to condensation, was dripping upon it. The committee visited each and every room in 21 establishments which have Federal inspection, and two establishments which have city inspection only. In all of the rooms in which meat was stored the committee made it a point to observe carefully to see if any rat dung could be detected. The committee was unable to find any rat dung on meat. It is difficult to perceive how dried rat dung could be found on piles of meat on which water was dripping from leaky roofs. In many of the abattoirs traps were set and cats were kept to reduce the number of rats, but in no case did the committee find that poisoned bread or other poisonous substance was used to kill rats. The committee agrees with the author that the statements contained in the above paragraph are "no fairy story and no joke," and believe them to be willful and deliberate misrepresentations of fact.

In considering the charges made in the publications herein noticed, the committee has confined itself to charges affecting the integrity and efficiency of the meat-inspection service at Chicago and the sanitary conditions of the abattoirs. No attention has been paid to charges regarding the sociological conditions of the employees of the various abattoirs.

Very respectfully,

JOHN R. MOHLER,
Chief, Pathological Division, Bureau of Animal Industry,
RICE P. STEDDOM,
Chief, Inspection Division, Bureau of Animal Industry,
GEO. P. MCCABE,
Solicitor Department of Agriculture,
Committee.

Approved and respectfully submitted to the honorable Secretary of Agriculture.

A. D. MELVIN,
Chief, Bureau of Animal Industry.

THE MEAT-INSPECTION LAW OF JUNE 30, 1906.

[Extract from an act of Congress entitled "An act making appropriations for the Department of Agriculture for the fiscal year ending June thirtieth, nineteen hundred and seven," approved June 30, 1906.—34 Stat. L., chap. 3913, pp. 674-679.]

That for the purpose of preventing the use in interstate or foreign commerce, as hereinafter provided, of meat and meat-food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food, the Secretary of Agriculture, at his discretion, may cause to be made, by inspectors appointed for that purpose, an examination and inspection of all cattle, sheep, swine, and goats before they shall be allowed to enter into any slaughtering, packing, meat-canning, rendering, or similar establishment, in which they are to be slaughtered and the meat and meat food products thereof are to be used in interstate or foreign commerce; and all cattle, swine, sheep, and goats found on such inspection to show symptoms of disease shall be set apart and slaughtered separately from all other cattle, sheep, swine, or goats, and when so slaughtered the carcasses of said cattle, sheep, swine, or goats shall be subject to a careful examination and inspection, all as provided by the rules and regulations to be prescribed by the Secretary of Agriculture as herein provided for.

That for the purposes hereinbefore set forth the Secretary of Agriculture shall cause to be made by inspectors appointed for that purpose, as hereinafter provided, a post-mortem examination and inspection of the carcasses and parts thereof of all cattle, sheep, swine, and goats to be prepared for human consumption at any slaughtering, meat-canning, salting, packing, rendering, or similar establishment in any State, Territory, or the District of Columbia for transportation or sale as articles of interstate or foreign commerce; and the carcasses and parts thereof of all such animals found to be sound, healthful, wholesome, and fit for human food shall be marked, stamped, tagged, or labeled as "Inspected and passed;" and said inspectors shall label, mark, stamp, or tag as "Inspected and condemned" all carcasses and parts thereof of animals found to be unsound, unhealthful, unwholesome, or otherwise unfit for human food; and all carcasses and parts thereof thus inspected and condemned shall be destroyed for food purposes by the said establishment in the presence of an inspector, and the Secretary of Agriculture may remove inspectors from any such establishment which fails to so destroy any such condemned carcass or part thereof, and said inspectors, after said first inspection, shall, when they deem it necessary, reinspect said carcasses or parts thereof to determine whether since the first inspection the same have become unsound, unhealthful, unwholesome, or in any way unfit for human food, and if any carcass or any part thereof shall, upon examination and inspection subsequent to the first examination and inspection, be found to be unsound, unhealthful, unwholesome, or otherwise unfit for human food, it shall be destroyed for food purposes by the said establishment in the presence of an inspector, and the Secretary of Agriculture may remove inspectors from any establishment which fails to so destroy any such condemned carcass or part thereof.

The foregoing provisions shall apply to all carcasses or parts of carcasses of cattle, sheep, swine, and goats, or the meat or meat products thereof which may be brought into any slaughtering, meat-canning, salting, packing, rendering, or similar establishment, and such examination and inspection shall be had before the said carcasses or parts thereof shall be allowed to enter into any department wherein the same are to be treated and prepared for meat food products; and the foregoing provisions shall also apply to all such products which, after having been issued from any slaughtering, meat-canning, salting, packing, rendering, or similar establishment, shall be returned to the same or to any similar establishment where such inspection is maintained.

That for the purposes hereinbefore set forth the Secretary of Agriculture shall cause to be made by inspectors appointed for that purpose an examination and inspection of all meat food products prepared for interstate or foreign commerce in any slaughtering, meat-canning, salting, packing, rendering, or similar establishment, and for the purposes of any examination and inspection said inspectors shall have access at all times, by day or night, whether the establishment be operated or not, to every part of said establishment; and said inspectors shall mark, stamp, tag, or label as "Inspected and passed" all such products found to be sound, healthful, and wholesome, and which contain no dyes, chemicals, preservatives, or ingredients which render such meat or meat food products unsound, unhealthful, unwholesome, or unfit for human food; and said inspectors shall label, mark, stamp, or tag as "Inspected and condemned" all such products found unsound, unhealthful, and unwholesome, or which contain dyes, chemicals, preservatives, or ingredients which render such meat or meat food products unsound, unhealthful, unwholesome, or unfit for human food, and all such condemned meat food products shall be destroyed for food purposes, as hereinbefore provided, and the Secretary of Agriculture

ture may remove inspectors from any establishment which fails to so destroy such condemned meat food products: *Provided*, That, subject to the rules and regulations of the Secretary of Agriculture, the provisions hereof in regard to preservatives shall not apply to meat food products for export to any foreign country and which are prepared or packed according to the specifications or directions of the foreign purchaser, when no substance is used in the preparation or packing thereof in conflict with the laws of the foreign country to which said article is to be exported; but if said article shall be in fact sold or offered for sale for domestic use or consumption then this proviso shall not exempt said article from the operation of all the provisions of this act.

That when any meat or meat food product prepared for interstate or foreign commerce which has been inspected as hereinbefore provided and marked "Inspected and passed" shall be placed or packed in any can, pot, tin, canvas, or other receptacle or covering in any establishment where inspection under the provisions of this act is maintained, the person, firm, or corporation preparing said product shall cause a label to be attached to said can, pot, tin, canvas, or other receptacle or covering, under the supervision of an inspector, which label shall state that the contents thereof have been "inspected and passed" under the provisions of this act; and no inspection and examination of meat or meat food products deposited or inclosed in cans, tins, pots, canvas, or other receptacle or covering in any establishment where inspection under the provisions of this act is maintained shall be deemed to be complete until such meat or meat food products have been sealed or inclosed in said can, tin, pot, canvas, or other receptacle or covering under the supervision of an inspector, and no such meat or meat food products shall be sold or offered for sale by any person, firm, or corporation in interstate or foreign commerce under any false or deceptive name; but established trade name or names which are usual to such products and which are not false and deceptive and which shall be approved by the Secretary of Agriculture are permitted.

The Secretary of Agriculture shall cause to be made, by experts in sanitation or by other competent inspectors, such inspection of all slaughtering, meat canning, salting, packing, rendering, or similar establishments in which cattle, sheep, swine, and goats are slaughtered and the meat and meat food products thereof are prepared for interstate or foreign commerce as may be necessary to inform himself concerning the sanitary conditions of the same, and to prescribe the rules and regulations of sanitation under which such establishments shall be maintained; and where the sanitary conditions of any such establishment are such that the meat or meat food products are rendered unclean, unsound, unhealthful, unwholesome, or otherwise unfit for human food, he shall refuse to allow said meat or meat food products to be labeled, marked, stamped, or tagged as "inspected and passed."

That the Secretary of Agriculture shall cause an examination and inspection of all cattle, sheep, swine, and goats, and the food products thereof, slaughtered and prepared in the establishments hereinbefore described for the purposes of interstate or foreign commerce to be made during the nighttime as well as during the daytime when the slaughtering of said cattle, sheep, swine, and goats, or the preparation of said food products is conducted during the nighttime.

That on and after October 1, 1906, no person, firm, or corporation shall transport or offer for transportation, and no carrier of interstate or foreign commerce shall transport or receive for transportation, from one State or Territory or the District of Columbia to any other State or Territory or the District of Columbia, or to any place under the jurisdiction of the United States, or to any foreign country, any carcasses or parts thereof, meat, or meat food products thereof which have not been inspected, examined, and marked as "inspected and passed," in accordance with the terms of this act and with the rules and regulations prescribed by the Secretary of Agriculture: *Provided*, That all meat and meat food products on hand on October 1, 1906, at establishments where inspection has not been maintained, or which have been inspected under existing law, shall be examined and labeled under such rules and regulations as the Secretary of Agriculture shall prescribe, and then shall be allowed to be sold in interstate or foreign commerce.

That no person, firm, or corporation, or officer, agent, or employee thereof, shall forge, counterfeit, simulate, or falsely represent, or shall without proper authority use, fail to use, or detach, or shall knowingly or wrongfully alter, deface, or destroy, or fail to deface or destroy, any of the marks, stamps, tags, labels, or other identification devices provided for in this act, or in and as directed by the rules and regulations prescribed hereunder by the Secretary of Agriculture, on any carcasses, parts of carcasses, or the food product, or containers thereof, subject to the provisions of this act, or any certificate in relation thereto, authorized or required by this act or by the said rules and regulations of the Secretary of Agriculture.

That the Secretary of Agriculture shall cause to be made a careful inspection of all cattle, sheep, swine, and goats intended and offered for export to foreign countries at

such times and places, and in such manner as he may deem proper, to ascertain whether such cattle, sheep, swine, and goats are free from disease.

And for this purpose he may appoint inspectors who shall be authorized to give an official certificate clearly stating the condition in which such cattle, sheep, swine, and goats are found.

And no clearance shall be given to any vessel having on board cattle, sheep, swine, or goats for export to a foreign country until the owner or shipper of such cattle, sheep, swine, or goats has a certificate from the inspector herein authorized to be appointed, stating that the said cattle, sheep, swine, or goats are sound and healthy, or unless the Secretary of Agriculture shall have waived the requirement of such certificate for export to the particular country to which such cattle, sheep, swine, or goats are to be exported.

That the Secretary of Agriculture shall also cause to be made a careful inspection of the carcasses and parts thereof of all cattle, sheep, swine, and goats, the meat of which, fresh, salted, canned, corned, packed, cured, or otherwise prepared, is intended and offered for export to any foreign country, at such times and places and in such manner as he may deem proper.

And for this purpose he may appoint inspectors, who shall be authorized to give an official certificate stating the condition in which said cattle, sheep, swine, or goats, and the meat thereof, are found.

And no clearance shall be given to any vessel having on board any fresh, salted, canned, corned, or packed beef, mutton, pork, or goat meat, being the meat of animals killed after the passage of this act, or except as hereinbefore provided for export to and sale in a foreign country from any port in the United States, until the owner or shipper thereof shall obtain from an inspector appointed under the provisions of this act a certificate that the said cattle, sheep, swine, and goats were sound and healthy at the time of inspection, and that their meat is sound and wholesome, unless the Secretary of Agriculture shall have waived the requirements of such certificate for the country to which said cattle, sheep, swine, and goats or meats are to be exported.

That the inspectors provided for herein shall be authorized to give official certificates of the sound and wholesome condition of the cattle, sheep, swine, and goats, their carcasses and products as herein described, and one copy of every certificate granted under the provisions of this act shall be filed in the Department of Agriculture, another copy shall be delivered to the owner or shipper, and when the cattle, sheep, swine, and goats, or their carcasses and products, are sent abroad, a third copy shall be delivered to the chief officer of the vessel on which the shipment shall be made.

That no person, firm, or corporation engaged in the interstate commerce of meat or meat food products shall transport or offer for transportation, sell or offer to sell, any such meat or meat food products in any State or Territory or in the District of Columbia, or any place under the jurisdiction of the United States, other than in the State or Territory or in the District of Columbia, or any place under the jurisdiction of the United States, in which the slaughtering, packing, canning, rendering, or other similar establishment owned, leased, operated by said firm, person, or corporation is located unless and until said person, firm, or corporation shall have complied with all of the provisions of this act.

That any person, firm, or corporation, or any officer or agent of any such person, firm, or corporation, who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and shall be punished on conviction thereof by a fine of not exceeding \$10,000, or imprisonment for a period not more than two years, or by both such fine and imprisonment, in the discretion of the court.

That the Secretary of Agriculture shall appoint from time to time inspectors to make examinations and inspections of all cattle, sheep, swine, and goats, the inspection of which is hereby provided for, and of all carcasses and parts thereof, and of all meats and meat food products thereof, and of the sanitary conditions of all establishments in which such meat and meat food products hereinbefore described are prepared; and said inspectors shall refuse to stamp, mark, tag, or label any carcass or any part thereof, or meat food product therefrom, prepared in any establishment hereinbefore mentioned, until the same shall have actually been inspected and found to be sound, healthful, wholesome, and fit for human food, and to contain no dyes, chemicals, preservatives, or ingredients which render such meat food product unsound, unhealthful, unwholesome, or unfit for human food, and to have been prepared under proper sanitary conditions, hereinbefore provided for; and shall perform such other duties as are provided by this act and by the rules and regulations to be prescribed by said Secretary of Agriculture; and said Secretary of Agriculture shall, from time to time, make such rules and regulations as are necessary for the efficient execution of the provisions of this act, and all inspections and examinations made under this act shall be such and made in such manner

as described in the rules and regulations prescribed by said Secretary of Agriculture not inconsistent with the provisions of this act.

That any person, firm, or corporation, or any agent or employee of any person, firm, or corporation who shall give, pay, or offer, directly or indirectly, to any inspector, deputy inspector, chief inspector, or any other officer or employee of the United States authorized to perform any of the duties prescribed by this act or by the rules and regulations of the Secretary of Agriculture any money or other thing of value, with intent to influence said inspector, deputy inspector, chief inspector, or other officer or employee of the United States in the discharge of any duty herein provided for, shall be deemed guilty of a felony and, upon conviction thereof, shall be punished by a fine not less than \$5,000 nor more than \$10,000 and by imprisonment not less than one year nor more than three years; and any inspector, deputy inspector, chief inspector, or other officer or employee of the United States authorized to perform any of the duties prescribed by this act who shall accept any money, gift, or other thing of value from any person, firm, or corporation, or officers, agents, or employees thereof, given with intent to influence his official action, or who shall receive or accept from any person, firm, or corporation engaged in interstate or foreign commerce any gift, money, or other thing of value given with any purpose or intent whatsoever, shall be deemed guilty of a felony and shall, upon conviction thereof, be summarily discharged from office and shall be punished by a fine not less than \$1,000 nor more than \$10,000 and by imprisonment not less than one year nor more than three years.

That the provisions of this act requiring inspection to be made by the Secretary of Agriculture shall not apply to animals slaughtered by any farmer on the farm and sold and transported as interstate or foreign commerce, nor to retail butchers and retail dealers in meat and meat food products, supplying their customers: *Provided*, That if any person shall sell or offer for sale or transportation for interstate or foreign commerce any meat or meat food products which are diseased, unsound, unhealthful, unwholesome, or otherwise unfit for human food, knowing that such meat food products are intended for human consumption, he shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding \$1,000 or by imprisonment for a period of not exceeding one year, or by both such fine and imprisonment: *Provided also*, That the Secretary of Agriculture is authorized to maintain the inspection in this act provided for at any slaughtering, meat canning, salting, packing, rendering, or similar establishment notwithstanding this exception, and that the persons operating the same may be retail butchers and retail dealers or farmers; and where the Secretary of Agriculture shall establish such inspection then the provisions of this act shall apply notwithstanding this exception.

That there is permanently appropriated, out of any money in the Treasury not otherwise appropriated, the sum of \$3,000,000, for the expenses of the inspection of cattle, sheep, swine, and goats and the meat and meat food products thereof which enter into interstate or foreign commerce and for all expenses necessary to carry into effect the provisions of this act relating to meat inspection, including rent and the employment of labor in Washington and elsewhere, for each year. And the Secretary of Agriculture shall, in his annual estimates made to Congress, submit a statement in detail showing the number of persons employed in such inspections and the salary or per diem paid to each, together with the contingent expenses of such inspectors and where they have been and are employed.

CHANGE IN LAW REGARDING TRANSPORTATION OF LIVE STOCK.

The statute commonly known as the "twenty-eight-hour law" was changed by act of Congress approved June 29, 1906. The old law, passed in 1873, prohibited the confinement in cars, boats, or other vessels for a longer period than twenty-eight consecutive hours of cattle, sheep, swine, or other animals in transit from one State to another without unloading the same for rest, water, and feeding for at least five hours, unless the animals were carried in cars, boats, or vessels in which they could and did have proper feed, water, space, and opportunity to rest. For some years there had been many violations of this law by railroads, despite the Department's efforts to enforce it. While the object of the law was good, in many cases it was a greater hardship to the animals and to the shippers to have the law complied with than to carry the animals on to their destination without unloading. At length the dissatisfaction on the part of the shippers led to the enactment of the new law, which permits an extension of the time to thirty-six hours on the written request of the owner or person in custody of the shipment. This request must be separate and apart from any printed bill of lading or other railroad form. Sheep, on account of their well-known objection to moving at night, are not required to be unloaded at night, but the time of their

confinement may not be extended beyond thirty-six hours. In most respects the new law is similar to the old, though occasion was taken to correct some defects of the old law. The penalty for each violation is from \$100 to \$500. The new law is as follows:

AN ACT To prevent cruelty to animals while in transit by railroad or other means of transportation from one State or Territory or the District of Columbia into or through another State or Territory or the District of Columbia, and repealing sections forty-three hundred and eighty-six, forty-three hundred and eighty-seven, forty-three hundred and eighty-eight, forty-three hundred and eighty-nine, and forty-three hundred and ninety of the United States Revised Statutes.—34 Stat. L., chap. 3594, p. 607.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That no railroad, express company, car company, common carrier other than by water, or the receiver, trustee, or lessee of any of them, whose road forms any part of a line of road over which cattle, sheep, swine, or other animals shall be conveyed from one State or Territory or the District of Columbia into or through another State or Territory or the District of Columbia, or the owners or masters of steam, sailing, or other vessels carrying or transporting cattle, sheep, swine, or other animals from one State or Territory or the District of Columbia into or through another State or Territory or the District of Columbia, shall confine the same in cars, boats, or vessels of any description for a period longer than twenty-eight consecutive hours without unloading the same in a humane manner, into properly equipped pens for rest, water, and feeding for a period of at least five consecutive hours, unless prevented by storm or by other accidental or unavoidable causes which can not be anticipated or avoided by the exercise of due diligence and foresight: *Provided*, That upon the written request of the owner or person in custody of that particular shipment, which written request shall be separate and apart from any printed bill of lading, or other railroad form, the time of confinement may be extended to thirty-six hours. In estimating such confinement, the time consumed in loading and unloading shall not be considered, but the time during which the animals have been confined without such rest or food or water on connecting roads shall be included, it being the intent of this act to prohibit their continuous confinement beyond the period of twenty-eight hours, except upon the contingencies hereinbefore stated: *Provided*, That it shall not be required that sheep be unloaded in the nighttime, but where the time expires in the nighttime in case of sheep the same may continue in transit to a suitable place for unloading, subject to the afore-said limitation of thirty-six hours.

Sec. 2. That animals so unloaded shall be properly fed and watered during such rest either by the owner or person having the custody thereof, or in case of his default in so doing, then by the railroad, express company, car company, common carrier other than by water, or the receiver, trustee, or lessee of any of them, or by the owners or masters of boats or vessels transporting the same, at the reasonable expense of the owner or person in custody thereof, and such railroad, express company, car company, common carrier other than by water, receiver, trustee, or lessee of any of them, owners or masters, shall in such case have a lien upon such animals for food, care, and custody furnished, collectible at their destination in the same manner as the transportation charges are collected, and shall not be liable for any detention of such animals, when such detention is of reasonable duration, to enable compliance with section one of this act; but nothing in this section shall be construed to prevent the owner or shipper of animals from furnishing food therefor, if he so desires.

Sec. 3. That any railroad, express company, car company, common carrier other than by water, or the receiver, trustee, or lessee of any of them, or the master or owner of any steam, sailing, or other vessel who knowingly and willfully fails to comply with the provisions of the two preceding sections shall for every such failure be liable for and forfeit and pay a penalty of not less than one hundred nor more than five hundred dollars: *Provided*, That when animals are carried in cars, boats, or other vessels in which they can and do have proper food, water, space, and opportunity to rest the provisions in regard to their being unloaded shall not apply.

Sec. 4. That the penalty created by the preceding section shall be recovered by civil action in the name of the United States in the circuit or district court holden within the district where the violation may have been committed or the person or corporation resides or carries on business; and it shall be the duty of United States attorneys to prosecute all violations of this act reported by the Secretary of Agriculture, or which come to their notice or knowledge by other means.

Sec. 5. That sections forty-three hundred and eighty-six, forty-three hundred and eighty-seven, forty-three hundred and eighty-eight, forty-three hundred and eighty-nine, and forty-three hundred and ninety of the Revised Statutes of the United States be, and the same are hereby, repealed.

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